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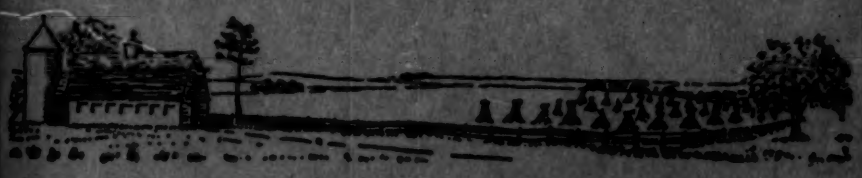

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The Farmer's Digest

Volume 14 January, 1951 Number 9

The Pike County Miracle

Condensed from The Acco Press

Bill Sansing

PIKE COUNTY — in southwest Mississippi—is the home of a growing agricultural miracle . . . a remarkable study in community cooperation and an astounding example of the profits that result from such a program.

Just four years ago, this "miracle" was but an ambitious plan on paper. Today, it already has exceeded its founders' most optimistic predictions, and the project's future potentialities have grown too big even to guess about. Thus, in the space of fifty months, one county's farmers, business men and agricultural experts have developed a program that has given an average community a balanced, prosperous economy that it badly needed. A combination of shrewd planning, forceful leadership and fullhearted cooperation has brought to Pike County a bright outlook that is unique among similar communities. This is a story that deserves the attention of farm communities everywhere . . . the story of an entire county pulling together . . . of a county where virtually every person is interested in the other fellow's progress . . . where banks will underwrite any worthwhile farm program . . . where business men—for the asking—will pour money into a needed project.

And if results will be convincing, just consider that a 1949 investment of $10,026.79 returned $1,362,625 through 1949 (that figure will be 'way up this year). Staggering statistics, though, can't describe the full story. There are parts of the program that can't be estimated, and there are other parts, like the warm "family" spirit that runs through the entire community—a product of this teamwork that cannot be measured in dollars.

The Pike County 16-point program is a closely integrated effort

Reprinted by permission from The Acco Press,
Houston, Texas, September 1950

of the farmers, business men, principal industries and agricultural agencies of that county. It was suggested editorially by the McComb Enterprise-Journal in 1947, grew into being through a series of meetings, and was originally underwritten for three years by 113 firms and individuals. It was farmer planned, farmer-agricultural expert executed and financed by business men.

Pike's four principal cities are McComb, Magnolia, Summit and Osyka, but the entire county takes part.

The program is now ending its third year. Everyone who participated is going to repeat, with new participants coming in. More and more farmers are taking part, both colored and white. Groups from the United States Chamber of Commerce and from the United Nations have observed it in action, Congress .has taken note of the program, and numerous community groups come to visit and "see how."

The story offers a model for any progressive community, anxious to improve its agricultural outlook. In order to break the program down into component parts, the story will be outlined from the point of view of its principals — farmers, business men and agricultural experts, and then each step will be described briefly, with details of some outstanding examples.

The Business Man

Banker Stennis Johnson is typical of the men who have put faith and dollars into the 16-point program.

Originally, Publisher J. O. Emmerich of the Enterprise-Journal, had suggested a coordinated plan. "We knew," he explains, "that we weren't going to get ahead on small one-crop farms—we had to put cotton where cotton would grow—and we had to furnish our own community with agricultural products we were then (1947) bringing in."

Bankers like Stennis Johnson and Magnolia's S. E. Babington, two of the project's early leaders, with all Pike Banks cooperating, started the pasture improvement contest. The county's banks encourage pasture improvement, award prizes to both white and colored farmers annually, with scores based on land use, fencing, mineralizing, seeding and management. Simultaneously, they offer recommendations, formulate plans, and just develop the project generally wherever possible.

Babington's bank, in Magnolia, has the largest bank dairy development program in Mississippi and Louisiana. An integrated team of banker-county agent-farmer works out finance problems, including, typically, items like cotton insect sprays. "We are going to improve our cotton pro-

duction tremendously—if we can just get our small farms to poison," Mr. Babington said. His bank pays contractors to spray farmers' cotton crops and charges the farmers' notes.

Beside the banks, there are individuals who cooperate on the business side, and there isn't a better example probably than L. L. Reid of Magnolia.

County Agent George Mullendore described Reid. "He's a typically alert, civic-minded business man who will help us with any problem." An example: Last year Mr. Mullendore urgently wanted anhydrous ammonia brought to Pike County to do the fertilization job that it had begun to do in the Delta to the north. He took Reid on an "educational" trip through the Delta, showed him what it could do for Pike, then asked that he put an anhydrous ammonia storage plant at Magnolia. It took a "sizable investment," patience (handling is difficult), an 8000-gallon storage tank plus six 1000-gallon farm tanks. Reid took the agent up and financed the installation.

Earlier in the program, Mullendore had suggested to Reid that a sweet potato storage plant —a place to hold the crop till prices rose after the season—would be a terrific boon to the county's small farmers. Reid financed this. He also encourages everything to improve the cotton yield. Lampton Reid—like many Pike County business men—has the foresight and will to work that have been a big part in making this miracle grow.

There are many others, of course. There are 113 individuals or firms that agreed to contribute from $5 to $50 a month for three years when the plan started back in '48. There are the civic clubs, every one of which sponsors a project, and of great importance has been the contribution of firms like the Illinois Central Railroad, which has worked with many of the projects, and the Mississippi Power and Light Company.

These are only a few, but they are typical of how and why business is playing a big part in Pike County's wonderful story.

The Farmer

E. A. Nunnery, of Pike County, is 77 years old and has made 55 straight cotton crops without a failure. He is typical of the farmers who have made the 16-point program operate at the "Grass Roots" level—the spot that is most important in the chain of cooperation. Nunnery is a model farmer. You name what should or could be done; he's done and is doing it.

It was 12 or 15 years ago that the late James W. Harrison, who led Pike's agricultural work as county agent for many years, told

E. A. Nunnery that he should diversify his crops. Then, all 200 Nunnery acres were in cotton.

"Today," County Agent George Mullendore says, "he's one of the very finest leaders in the job of crop diversification. He now has 20 acres in cotton, 15 in hybrid corn, 150 in pasture and three acres in sweet potatoes."

"He makes wonderful use of his land," Mr. Mullendore continued. "He puts cotton on cotton land following cover crops. He follows fertilization recommendations to the letter, and he does an excellent job of dusting to control insects."

Mr. Nunnery's grandson, Billy, who stands 6 ft., 4 in., was a graphic aid in illustrating the height of hybrid corn, as he stood at least three feet under some of the towering plants. It was Hybrid Dixie 18 corn, and the growth was aided by 500 pounds of 5-10-5 and 300 pounds of ammonium nitrate.

Mr. Nunnery's cotton last year won first prize in the program's awards for cotton yields. He was also one of the original farmers who planned the 16-point program from the start, and he is a director of the PCA.

Agent Mullendore points to examples like this as the "real reason this plan has worked out so well."

A full span of Pike County farmers have done well. There's Jimmy Troutman, a lad who came to Pike County after the war, and is doing a magnificent job of reclaiming a washed-out, red dirt farm. He is studiously working with Soil Conservation Service technicians and pasture experts. He is slowly building up the farm, portion by portion—was financed by Banker Johnson—is using lime, and a good land-use plan—is building up a fine young registered Guernsey herd—won last year's 16-point pasture contest—is raising seed, and has a new tractor and combine for his forage-pasture-dairy farm.

This list could include many other farmers, both white and colored, and could tell in detail their work with the various parts of the 16-point Program. Hundreds utilize the lessons of the big staff of agricultural workers, and adhere to the simple, effective aids like S. E. Babington's bank calendar which details a day-by-day program for pasture improvement.

These farmers are absorbing more and more of the lessons the 16-point outline makes available. Less progressive farmers, at neighboring places, noting advances made during the program's three-year history, are hurrying to catch up. A number of colored farmers have made equally broad strides, with help from the extension staff. With plans made and financing assured, it is the farmer's end of the program that is now making its swiftest progress. A favorite

saying of George Mullendore is, "there's more in the man than in the land," and that sums up a second—and a solid—reason for the Pike County "Miracle."

"I don't farm half as well as I know how now!" is the age-old retort of the farmer besieged with advice. Consider then, the unusual situation in Pike County, an average-sized Southern Mississippi County, where the farmers besiege the Extension Service for advice and it takes a staff of fifteen people to keep up with requests for help.

The County Agent's office is not, however, the sole group of agricultural workers that is working with the 16-point Program. Even though one person after another says, "We've got the finest County Agent in the world," and the McComb paper stated: "County Agent Mullendore is the directing genius behind the program," George Mullendore is the first person to pass the credit around.

He points out that all the agricultural workers—comprising the Agricultural Workers' Coordinating Council—were in on the original planning in 1947. He tallied off some of the working groups through the three years: "Soil Conservation Service, the PMA, Vocational Ag groups, Veteran instructors, the FHA, the Extension Office, the PCA, the Forestry service, and agricultural experts of the Illinois Central Railroad and of the Mississippi Light and Power Company.

Just as it's necessary to single out individual business men and farmers, the Extension Staff is singled out as representing the typical group of agricultural workers —the third integral factor of this work.

Fine leadership has been a tradition in the Pike County Agent's office. The late J. W. Harrison, who did such excellent work in behalf of livestock breeding and production, was county agent there for ten years. George Mullendore, alert, and hard-working, has done a huge job as County Agent during the three working years of the 16-point Program. He has a full staff of excellent experts . . . men like Elmer Edwards, Assistant Agent; Carl Izard, livestock; Harry Rogers, poultry; and Marcus W. Peterson, agronomy. There is, too, a four-person colored extension staff.

The appointment of this staff of specialists was one of the original sixteen points. These assistants are paid jointly by the county, the program and the Mississippi State College. The result is not only a full staff (a total of fifteen people in all) but a well-rounded one to advise on the widening scope of Pike County activities. The Pike County Board of Supervisors backs the program 100 percent.

Rogers' work, for example, has been necessary to the phenomenal growth in the community's poultry industry. In 1947, Pike County produced only 5,000 broilers every twelve weeks, far below the community's own requirements. Effective cooperation between farmers, banks and Rogers has led to raising that total to about 100,000 birds each twelve weeks. By the end of 1950, there also will be a healthy number for export to large cities within range. Thus, a new industry was born, the county has moved nearer a balanced economy by supplying its own needs, and another big step in diversification is complete.

Other results have been equally significant. Elmer Edwards' strong 4-H Clubs (Pike County calls them "our finest crop") were judged the best in the state. Young Carl Izard's experience has had strong influence on the improved livestock situation.

These agricultural experts complete the teamwork chain, and much of the success that's been achieved can be traced to their leadership.

The 16 Points

1. Improvement of Sweet Potato Values

Storage facilities were the first requirement—to keep crops until favorable market arrived. L. L. Reid was asked to build, and built a storage plant with a 30,000 bushel capacity. In 1949, the increase in the commercial sweet potato crop in Pike County, over the 1948 crop, amounted to near $24,000; the McComb Exchange sponsored a "Yam Festival" publicizing the sweet potato work, spread interest.

2. Artificial Breeding

This program, begun by Mr. Harrison, can be measured in statistics. In 1947, 870 cows were bred artifically from the Center; in 1948, the number rose to 1807; in 1949, the number went to 5,394, and the work served counties across the southern edge of the state. Today, Howard Newsom, an LSU graduate, directs the artificial breeding plant. It has nine fine bulls, including Jester Standard Gold, grandson of one of the greatest living Jersey cows, Ena Design Standard Gold. He is one of three bulls loaned by the Illinois Central.

3. State Dairy Show

Established as a result of the 16-point Program, the show has the cooperation of the Mississippi Legislature. The show has doubled in size each year since it began. In the highly competitive circuit of dairy shows around the state, Pike County entries have been winning more and more prizes.

4. Increased Cotton Yield

In Pike County, as in many portions of the Cotton Belt, the cotton problem is one of climbing back to the big yields of the twenties. Cotton now is being fitted into varied farm programs, is being controlled for insects and is being planted following cover crops. In 1947, Pike produced 4,000 bales on land that should theoretically produce 8,000. Despite a "bad cotton year" in 1949 (mostly because of rain), the drive is making excellent progress in 1950. Concerted insect control is the principal reason. Of course, prizes offered by the program are a big incentive; help from the banks is another key to the improvement. The program's only fair cotton test was the 1948 gain over 1947. Then, after only one year, the program showed a doubling of yields, a cash improvement—despite a lower market—of two-thirds of a million dollars. Actually, the real returns should come in '50. Top farmers, like E. A. Nunnery and A. R. Merritt are shooting at two bales. That's six times the '47 county average.

5. 4-H Club Banquets

These are a climax to Assistant Elmer Edwards' splendid 4-H program. There are two annually, one for white and one for colored. Membership has grown by about 500 each year of the program and is now near 3,000. The 4-H Club products are worth approximately $75,000 each year.

6. Beef Cattle Chain

Young Pike County 4-H Club members are building up fine herds with the "chain" which awards deserving youngsters a calf, then takes back in payment the first heifer calf produced. This endless chain is serving as the starting point for some fine young beef cattle herds. Boys like O. C. Simmons, Jr., who is just 16, are well on their way. O. C. received his calf in 1948; its descendants include three heifers (he returned one to the chain) and a bull. Guidance by livestock experts and additional fine-blooded stock by the project's original sponsor, the McComb Lions Club, is giving added impetus.

7. Employment of Trained Personnel

The big Extension Staff now numbers fifteen people, including a four-person colored staff. The value of these trained experts, the more-than-usual specialist advice made available to farmers, is simply another reason for the program's success, and testimony to its original sound planning.

8. Spring Cattle Show

This is a four-county show which has been growing in size, receipts, prizes and importance since the 16-point Program got

under way. It has stimulated the record-high weekly livestock sales at the Summit Auction, which averages better than 750 head a sale.

9. Eradication of Bangs Disease

County-wide vaccination has been the weapon used in this program, with Livestock Expert Carl Izard and the Magnolia Rotary Club giving good leadership. In one month in 1950, 400 head had been vaccinated, with an equal number on the rolls for treatment in the near future.

10. Lime Bank

Here is an excellent case history of one of the 16 points in action. Lime is a necessity for fine pastures and the idea for an easy-to-get lime bank was originated by Banker Stennis Johnson. Next, the Illinois Central donated sites along its tracks for the lime to be placed. Banks underwrote a trucking service. All in all, it was made as easy and cheap as possible. This is a far cry from the usual process —where a few progressive farmers and dairymen pitch in and buy a carload. Today, lime banks are scattered across the county, and trucks can be seen on any highway making deliveries. Consider these figures: In 1947, Pike County utilized (before the program) only 33 carloads of lime. That climbed to 224 carloads in 1949, and the first six months of this year had already seen that figure topped.

11. Pasture Improvement

An allied project, but separate from the lime bank, this has been industriously pushed by banks in the county. It represented one of the largest potentials in the program at the outset. Today there are about 20,000 acres of improved pasture, *twelve* times what was here in 1947. Banks issue explicit instructions on recommendations for grazing, mineralizing, fertilizing and seeding, with generous cash rewards for winners. This point is aimed at improving all of the county's 45,000 acres of pasture. Considering the progress in three years, the aim is not too high.

12. Expansion of Poultry Values

This is one of the most productive points, so far as results go. Broiler production has leaped by over 1000 percent, two poultry packing plants have been built, a number of fine poultry farms have been developed, the community has now reached the point of satisfying its own needs, and is looking forward to a profitable export business. Once again, the story of b a n k - f a r m e r - agricultural worker cooperation.

13. Increased Corn Yield

The introduction of hybrid corn

and efficient fertilization were the tools with which the county set out in 1947 to double its corn yield. Time allotted was three years. The county average at the time the plan went into effect was 15 bushels per acre. A number of farmers went over 80 bushels last year, with several making over 100 bushels per acre. In all, the yield was doubled in two years, instead of the allotted three, and sights set higher.

14. Forestry Improvement

This was a project of the Summit Rotary Club. Its one-year dollar estimate of improvement (1949 over 1948) was more than $87,000. This has been done by stimulating interest in proper thinning, protection and marketing of timber. A big help has been the 4-H and FFA white and colored Conservation Camps, which train young Pike County men for an even finer forest future.

15. Dairy Herd Chain

Working on the same principle as the beef chain, here is another opportunity for youngsters to build fine young herds. A model in this work is 17-year-old James Barclay, Jr. He was given his Jersey calf in 1948, now has four registered Jerseys. He's been active in all types of 4-H Club work for seven years, has fed out three beef calves, has made over 100 bushels of corn to the acre, and has attended the State 4-H Congress and the Conservation Camp.

16. 4-H Club Development

The fine direction of Elmer Edwards, Assistant County Agent, has given impetus to this development, partially described under Point Number 5. The influence of this strengthened 4-H program shows up in at least a dozen of the 16 points, and is in itself a model for the nation, with 4-H National headquarters' representatives having been down to see it in action.

Lighter Concrete

Air bubbles may replace sand in concrete. Engineers say the tiny bubbles make concrete lighter, a better insulator and more resistant to water penetration.

—Cappers Farmer

New Tonic for Sick Cows

Condensed from The Aberdeen Angus Journal

Colin Kennedy

IT'S MORE than meat that comes from the slaughter house these days. The adrenal glands, for example, are saved for the production of adrenalin, the pancreas is saved for the production of insulin, the pituitary glands of the brain are saved for the production of pituitrin and several other extracts which are used in stimulating the organs of reproduction. The liver produces extracts which are used very successfully in treating anemia in both human and veterinary practice. Soon the digestive juices from a freshly slaughtered cow and sheep stomach will be available to every veterinarian to assist in the treatment of many diseases in these animals. An Iowa Veterinarian, Dr. Harry S. Lames, of Dysart, recently found a new use for a freshly butchered beef stomach.

Our Grandmothers made bread with a "starter." Occasionally this starter would "run out" or die and she would have to go to a neighbor's house in order to replenish the starter before she could make another batch of bread. Science has found that any disease that is severe enough to cause the animal to lose its appetite, kills the bacteria, hormones, and enzymes which carry on the normal digestive processes of the beef and sheep stomach. When this occurs it has been impossible in most cases to reestablish this healthy flora, with drugs, in the rumen of the cloven-hoofed animals. Dr. Lames decided to try to replace or renew this so-called starter. The juices from the contents of the rumen are extracted and the resulting two to ten gallons of juices are pumped into the stomach of an ailing cow, steer, or calf along with all the water they can comfortably take.

It is used in cases where the animal is already excessively weakened and then refuses to eat. The initial disease might have been acute or chronic bloat, acetonemia, shipping fever, or scours due to some infection, any one of which has a weakening effect. The body becomes dehydrated, that is, the tissues lose their normal amount of water, maybe because of high fever or scouring and the animal will not drink enough to replace the loss. There are many such diseases which destroy the appetite.

The secret is in transplanting

Reprinted by permission from The Aberdeen Angus Journal,
Webster City, Iowa, August 1950

the new flora for the digestive tract. Digestion in the rumen of the cow depends on special enzymes and bacteria. In certain sicknesses, the action of the rumen seems to go dead. Then, the digestive juices from a healthy beef, freshly slaughtered, can supply it with new life. Dr. Lames has been using this method for the past year and a half with astonishing results. He has listed some specific cases.

Case number one, a cow, recently freshened, had not eaten for two days, was scouring profusely and was so wobbly she could hardly stand. The temperature was normal but the animal was badly dehydrated with sunken eyes, and a peculiar sweetish odor to the breath indicative of acetonemia. The animal was given milk fever and acetonemia treatment plus a bowel astringent, and thirty gallons of water by way of the stomach tube. The next morning the client procured a beef stomach and the juices were extracted. These were administered about three p.m. in thirty gallons of water by way of the stomach tube to the animal which was so weak she could not stand up. The following morning she was well on the road to recovery. Turned out to pasture she drank water and ate grass intermittently all day.

Case number two—a cow with retained afterbirth, had a temperature of 107 degrees. She was given the usual treatment for such cases—and in addition, ten gallons of digestive juices from a fresh bovine stomach. Next morning her temperature was normal and she had eaten a little feed. She got up, while they were working on her. They turned her out to pasture and she went to grazing immediately.

Case number three was a Holstein cow. Her owner thought she had hardware disease, (that is, foreign material, like baling wire, and nails, in the paunch). Cows will frequently swallow materials of this nature and eventually it may puncture the wall of the rumen and cause death.

"She had gone off on her milk," said Dr. Lames, "and had been a mincing eater for several days. She had a full, hard slowly moving rumen, and a peculiar sweetish odor to the breath." Otherwise the cow seemed normal. She didn't respond to purgatives and other medication. In three days, there still was no change, so they went to the local locker plant for a fresh stomach. The juices were administered about 6 p.m. and by the next morning the cow had started eating, and gave no further trouble.

"I was called one Thursday morning to see a bloated club calf. The calf was relieved of the gas by use of the stomach tube and the odor was so foul I was

sure no medicine at my disposal could restore the calf's stomach to normal function. The owner was asked to procure a fresh stomach from a local locker plant or the packing house which he failed to do. That evening I was called again and administered more drugs which I knew would give only temporary relief and the owner was again instructed to procure a stomach for use the first thing the next morning. He again neglected to do this but came to my office Friday just after noon and informed me the calf was no better. I called the local locker plant and obtained two fresh stomachs from which we extracted twenty quarts of fresh digestive juices. Upon arrival at the farm the calf was relieved of his bloat by stomach tube, the gas being very, very putrid. There was room for only ten quarts of juices.

"Before I left the above place a Holstein cow was presented which had refused her feed that morning. Her temperature was normal, nose moist and there was a slight amount of gas in her stomach. This animal was given the remaining ten quarts of digestive juice. The owner reported the next evening that he and his wife went to a card party Friday night, upon their return home both animals were chewing their cud and both had made an uneventful recovery without further treatment.

"In the case of sixteen white-face calves, from three to six weeks of age still nursing their mothers, one had died just prior to my arrival on Monday morning. The calves were given penicillin, serum and the customary bowel astringents three times daily. Treatment was repeated Tuesday and medicine was left for the owner to administer. By Thursday the calves had become progressively worse and it looked very much as if we would lose them all. Then one pint of digestive juices was administered to every calf along with other treatment. The next day there was only one calf still scouring. This calf was given one quart of digestive juices and two others were given one pint. The next day, Saturday, all calves had ceased scouring and we gave the sickest calf, which had received a quart of digestive juices on Friday, an additional pint. These calves all made an uneventful recovery.

"In a herd of ten Jersey bucket calves, one died just prior to my first visit. The calves were from three to twelve weeks old and had been given calf scour medicine prescribed by two practicing veterinarians prior to my visit. Five more were so weak they could hardly stand up and one of these succumbed on the fourth day. They were all given one pint of stomach extract along with other treatment. All eight of the calves made successful recovery."

In every case, fresh digestive juices from a normal bovine stomach seemed to turn the trick. Merely to stop the course of the disease had not been enough; it was necessary to get the animal's nourishment factory going again.

"Now we're experimenting with freezing the digestive juices to see how long they will retain their potency," said Dr. Lames, "They decompose rapidly if left at room temperature."

Dr. Lames predicts that administering healthy digestive juices will before long be found to be an indicated treatment for many diseases and will be administered simultaneously along with calcium gluconate, sulfas, penicillin, streptomycin, and aureomycin.

20% More Corn

Condensed from Successful Farming

Hadley Read

IF YOU own or can rent a self-propelled combine, you may want to plant some of your corn and soybeans in the same field this spring, using alternate double rows of corn and beans. If you do, chances are you will get an increase in your corn yield of as much as 20 percent over your regular corn-planting system.

The Production and Marketing Administration reports that if the corn and soybeans are planted in equal-width rows, and the same number of rows of each, only the area actually planted to corn counts against your corn allotment. In other words, a 10-acre field, with corn and beans evenly alternated, would count only as 5 acres of corn.

Three years of research at the University of Illinois College of Agriculture—and the experiences of a number of Cornbelt farmers—have resulted in plenty of evidence that this new system of alternate corn-soybean planting is not just a passing fad. Corn yields are definitely boosted, with little or no decrease in bean yields.

A. L. Lang, agronomist at the University of Illinois, was one of the first men to make practical use of this alternate planting technique in the Cornbelt. He started in 1947, continued the work in 1948. Last year, he set up con-

Reprinted by permission from Successful Farming, Des Moines, Iowa, May 1950

trolled experiments with alternate planting of corn and soybeans on experimental fields in three different parts of the state—Urbana, Hartsburg, and Joliet.

When Lang figured the yields for the three fields, he found that the corn planted with soybeans had yielded an average of 20 percent more per acre than the corn on the check plots, planted in the conventional manner. The average yield of corn from the corn-bean planting was 111.1 bushels per acre, compared to 92.4 bushels for the plots with all corn—an increase of 18.7 bushels.

On the Urbana field, the corn on the alternate planting plot yielded at the rate of 121.1 bushels per acre, compared with 109.9 bushels for the all-corn plot. That's a difference of 11.2 bushels in favor of the alternate system. At Hartsburg, the increase credited to alternate planting was 22 bushels per acre—119 bushels compared to 97 bushels for the plot with all corn. At Joliet, the difference was 22.7 bushels per acre, with alternate planting again on top. The corn in alternate rows yielded at the rate of 93.1 bushels per acre, compared to 70.4 for the check plot.

All these yield figures are for planting in the standard-width rows of 40 inches, with a planting rate of 14,000 plants per acre.

Even bigger increases were credited to alternate planting by three Illinois farmers who reported to Lang. Cecil Walker, who farms one of the Sibley Estate farms in Ford County, reported that he tried out the alternate corn-soybean planting on one of his fields. The yield of corn was 96 bushels per acre, compared with 72 bushels for the field he used as a check. That 24-bushel difference amounts to more than a third increase.

On one other Sibley farm, Francis Pretzleff reported that the corn in alternate double rows with beans yielded 62 bushels per acre compared with 45 bushels for another plot in all corn. That's a 17-bushel increase, amounting to 37 percent.

Lang started studying the effects of alternate corn-bean planting three years ago, on the Howard J. Babb farm a few miles north of Champaign. As most of you remember, 1947 was a dry year. In Lang's experiment on the Babb farm, the corn in alternate rows outyielded the check planting 27 bushels per acre.

In 1948, which was almost a perfect corn year, the alternate planting on the same Babb farm gave a corn yield of 103 bushels per acre, 15 bushels per acre higher than the 88-bushel yield registered for the check plot.

Lang points out that the advantages of alternate corn-soybean planting are not so unusual, when a person stops to think

about it. Research workers for many years have known that the outside—or border rows—of their experimental plots usually gave higher yields than the inside rows. For that reason, these border rows are not included in figuring yield data. Farmers who have had a cornfield bordering on an oats or bean field have noticed that the outside rows are heavy yielders. As Lang explains it, alternate planting of corn and soybeans tends to make every corn row an outside, or border, row.

About the only problem you face in using the alternate planting system is the harvesting of the beans, which normally would be combined before the corn is picked. This is no problem if you own or can hire a self-propelled combine.

There are no planting or cultivating problems. In planting with a 2-row planter, one box is filled with beans, the other with corn. With a 4-row planter, the inside boxes are filled with either beans or corn and the two outside boxes with the other.

Lang plans to continue the alternate planting studies this year. More evidence is needed on the effect of changing the rate of planting, either through narrowing the rows or upping the planting rate within the row. Some data were collected on this question last year. Increasing the planting rate from 14,000 per acre to 20,000 per acre resulted in a 4.6-bushel decrease in corn yield on the plots all in corn.

But that increase in planting rate gave a 32.6-bushel increase for the corn planted alternately with beans. In other words, at a planting rate of 20,000 plants per acre, corn planted solid yielded 105.3 bushels, while the corn in alternate rows yielded 153.7 bushels—a profitable difference of 48.4 bushels per acre.

Ladino In Bluegrass

If you want to establish ladino clover in permanent bluegrass pasture don't broadcast it on an undisturbed sod, advises L. E. Thatcher, Ohio Experiment Station. That practice will not get a good stand.

A better method is to work up the sod with a disk or field cultivator and have some loose soil to catch the seed. Working the sod also holds back the bluegrass until the ladino is established. Seedbed preparation may be started in fall and early winter. Seed should then be sown in the spring after giving the sod an additional working.

—Cappers Farmer

Death Losses in Newborn Pigs

Condensed from The Berkshire News

W. M. Beeson
Purdue University

PREVENTING the loss of newborn pigs is one of the most important problems in the field of swine production. Man has taken the sow out of her natural environment and assumed the responsibility for giving her all of the nutrients necessary to maintain life and reproduce normal young. The fact that a hog roots is not a coincidence or a malicious habit, but probably an instinct of looking for some of the minor nutritional elements that are not supplied in her diet. When hogs are removed from lush growing green pastures into an artificial environment devoid of green material then nutritional deficiencies develop which many times contribute to the loss of newborn pigs.

A conservative estimate indicates that 20 percent or more of the pigs farrowed on farms are either stillborn or die within the first few days after farrowing. These figures take on greater significance and become more startling by examination of actual experimental records.

Farrowing records at the Purdue Swine farm include the pig losses in 1336 spring litters produced through a period of 24 years (1921–1944). These litters contained a total of 13,108 pigs of which 5.16 percent were stillborn, 18.22 percent died or were accidentally killed when 1 to 3 days of age, 6.48 percent were lost from the 4th to the 14th day, and 4.7 percent from the 15th to weaning at 56 days of age. The average litter contained 9.8 pigs when farrowed; and 6.42 at weaning time, representing a loss of 34.56 percent, which includes the 5.16 percent stillborn pigs.

The economic importance of saving pigs must not be overlooked. The number of pigs in the average weaned litter in the United States for the past decade was slightly more than six. If the number could be increased to eight, then three sows should equal the former production of four, an increase of 25 percent in production efficiency. Applying such a change in pig saving to the farm, state, and nation, the following figures illustrate its potential significance. Where 180 to 190 pigs are raised annually on a farm using the 2-litter system, 12 in-

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Springfield, Illinois, September 1950

stead of 16 sows could do the job. In Indiana 340,000 sows instead of 450,000 would be required to produce the average annual pig crop. In the United States, using the two-litter system, 6,250,000 sows would be required to produce the annual pig crop (1933–42). If the number of pigs weaned per sow could be increased to eight, 4,700,000 instead of 6,250,000 sows would be sufficient to produce the average pig crop.

Every pig that dies between 1 to 3 days of age represents an approximate loss of 100 pounds of feed, if the pig dies around 21 days of age, 150 pounds of feed would be lost and the death of a pig during the latter part of lactation or at about 56 days of age results in a loss of 200 pounds of feed. These figures are based on the feed requirement for the sow and litter during gestation and lactation.

Current Purdue studies on about 1000 young pigs which died or were purposely killed during the first week after farrowing indicate that a large percentage of the deaths are caused by pathological abnormalities at the time or shortly after birth, instead of physical injury. Among the more common lesions which have been observed are: (1) enlargement and fatty degeneration of the liver; (2) albuminous degeneration of the kidneys; (3) edema (puffy swelling of tissue); and sometimes an enlargement of the thyroid and adrenal glands. A relatively small number of the pigs showed evidence of injury (trauma) due to being stepped on or laid on by the sows. In some instances marked precipitates (probably ureates) were present in the kidneys. These abnormalities apparently develop during embryonic life and not after the pigs are born.

Too often it has been erroneously assumed by swine research workers and producers that most of the losses in young pigs are caused by accidental death or physical injury. Post-morten examinations at Purdue have definitely shown that very few healthy pigs are killed by carelessness of the mother during the first few days of life. It seems that most of the losses are due to the fact that the pigs are subnormal, unresponsive and make little effort to escape injury. Apparently the pigs are born abnormal and even though the sow is producing adequate amounts of milk, the pigs are not able to assimilate it. A majority of the pigs examined do not show any evidence of starvation but are abnormal and die even on a full stomach.

For several years, especially during the war period when many high quality feeds were not available for swine feeding, there has been heavy death loss in baby pigs

among farm herds. This loss is so great at times that it leaves some farmers practically without pigs. Further evidence by various experiment stations, namely, Missouri, Wisconsin, Illinois, and Purdue show that a large percentage of the baby pig losses are due to nutritional deficiencies occurring during the gestation and lactation period of the sow. In the past we thought a ration composed of corn, soybean meal, tankage, fishmeal, minerals and cod-liver oil was a balanced diet for gilts or sows in dry-lot but recent research at several mid-western experiment stations (Illinois, Missouri, and Wisconsin) has shown that when sows are confined to a diet of this character in dry lot many times 50 to 80 percent of the pigs die before weaning and a majority of these losses occur in the first few days of life. Apparently some nutritional factor or factors necessary for the development of the pig during embryonic life and for the pig's health at birth and during suckling are not contained in commonly accepted feeds such as corn, protein supplements and minerals.

This brings us to the question of how can we feed sows and gilts in order to prevent these nutritionally caused death losses. To my knowledge no one as yet has isolated the specific factor or factors, that will prevent these deficiencies, although many specific factors, such as several of the vitamins of the "B" complex have been suggested by various research workers at Illinois and Wisconsin. However, it has been shown by research workers at Wisconsin and Illinois and by preliminary studies at Purdue that these deficiencies may be partially prevented and the livability of the pigs improved by mixing 10 to 15 percent by weight of high quality alfalfa meal in winter sow rations. Fortification of the diet with alfalfa meal increased the number of pigs weaned from 10 to 80 percent under dry lot conditions (Illinois). In addition to the many vitamins, minerals and high quality protein supplied by ground legume, it has the additional value of adding fiber or bulk to the sow ration, which aids materially in preventing the sows and gilts from becoming too fat, and it also provides a bulky diet at farrowing time.

A second and even better method of supplying these indispensable nutrients is to allow the sows and gilts free access to green pasture. Even though pasture is not available during the entire winter gestation period, Purdue and also Illinois results indicate that sows are capable of storing certain amounts of these nutrients during pasture feeding which will aid in carrying them through the latter part of the gestation period

when green forage is not available. Recent research at the University of Illinois has shown the residual effects of rye pasture by a survival of 90 percent of the pigs from sows on rye pasture during the winter gestation period as compared to only 26 percent from dams fed on the basal diet in dry lot. However, for extra protection and insurance it is advisable to add 15 percent or more of high quality alfalfa meal to the sows diet after the green forage is gone.

It should be emphasized that alfalfa meal or other ground legumes used in hog diets should be fine stemmed, leafy and bright green in color. Legume hays that have been stored for long periods of time or that have been processed under poor curing conditions probably have lost many of the nutritional factors required by hogs. Poor quality ground legumes are of questionable value. Save some of the highest quality, bright green, leafy fine-stemmed hay for the hogs.

You will note that I have emphasized the use of highly colored feeds either in the fresh or cured form for sow ration. Since green color is the symbol of health and lush growth in the plant world, green color should also be regarded as the symbol of well balanced swine rations.

There Is Economy In Good Feeding

Condensed from The Shorthorn World

A. L. Ward

How well do you feed your cattle? That question may mean more than you think. True, it asks how much you feed. But, well-fed cattle get more than volume of feed. They get a balance of nutrients . . . nutrients which satisfy their needs and utilize their full inherited ability for production. Furthermore, these nutrients are supplied in the most economical form. So, we have not just merely asked you how much you feed. We actually have asked you how good you are as a cattleman and as a businessman, because success in cattle raising cannot be separated from either good nutrition or feed economy.

The type of ration to use will vary with kind of cattle and the purpose for which they are kept,

Reprinted by permission from The Shorthorn World, Aurora, Illinois, September 10, 1950

the feeds available and the conditions existing. However, the principles of good cattle feeding remain the same. Good pastures, home grown roughages and grains, adequate supplemental protein and simple mineral mixtures are the basis for good production and most economical feeding.

Both purebred and commercial cattle breeders are most successful when the calf crop percentage is high; the calves are large and growthy; and the mother cows have a long, productive life. Adequate feeding is necessary in accomplishing these things.

The Nebraska Experiment Station proved this point effectively a good many years ago. Starting with 400 pound heifers, one group was wintered for five years with all the prairie hay they would eat. A similar lot was fed one pound of cottonseed cake, daily, in addition to prairie hay. The cake-fed heifers were growthier at the first calving and ended the five-year experiment 150 pounds heavier than the heifers receiving hay alone during the winter. Calves weaned from the cake-fed cows were 50 pounds heavier and at the third calving, the cake-fed cows produced a 100 percent calf crop as compared to a 50 percent calf crop from cows not receiving cake. Did adequate feeding pay there? These weaning weights and calving percentages tell the story but in order to be more specific with today's conditions, let's apply present feed and beef prices. The 817 pounds of winter-fed cake would cost about $30 today. It produced about 450 pounds of additional beef which would bring over $100. Adequate feeding is not an expense. It is a wise investment.

The purebred breeder has an interest in adequate feeding which cannot be measured strictly in terms of gains and calving percentage. Without good feeding, cattle never have an opportunity to show the full advantages of good beef breeding. Adequate, not excessive, feeding brings out the early development, thick natural fleshing, depth and capacity which is essential in beef breeding cows and bulls. Just as with commercial cows, good feeding promotes high production and good performance in the purebred breeding herd. Good production and good conformation are selling points which add to the dividends purebred breeders get from adequate feeding.

In the feedlot, as in the breeding herd, adequate feeding is a matter of prime importance. Volume of feed in the feedlot is seldom a limiting factor since anyone fattening cattle realizes that plenty of feed is necessary for good gains. However, waste of feed through failure to balance rations and the use of poor feed-

ing practices which cause cattle to go "off feed" is an indication of inadequate feeding. Too often, cattle feeders start cattle on heavy concentrate rations abruptly or fail to include enough roughage to provide sufficient bulk in the ration. Balancing the ration with protein is necessary for fast and efficient gains, good appetite and high finish. Practical experience and feeding experiments have shown, time and again, that when fed in amounts necessary to balance the ration, 100 pounds of cottonseed meal or other similar protein concentrate, will save 250 to 300 pounds of grain in cattle fattening rations.

When cattlemen ask "What and how much should I feed to make the most profit?" we think first of the volume and quality of pasture. Certainly, good pasture is a sound foundation in the cattle raising enterprise. Breeding and growing cattle rations should be largely pasture forage because the cattle obtain nutrients from it more economically than from harvested crops. If we would improve our cattle feeding practices, much of our attention must be directed toward improving our pastures.

However, pasture improvement is a long term program and, even with excellent pasture, supplemental feeding is an important and valuable part of cattle raising. Harvested roughage such as hay, silage or cottonseed hulls should be supplied in amounts needed to give the cattle a good fill if the pasture does not provide enough volume. The use of a small amount of supplemental roughage often is needed to rest the pasture and avoid overgrazing. Young, lush legume pastures often cause bloat and scours, and may not furnish sufficient dry matter. At such times some dry roughage, such as cottonseed hulls, hay or ground bundles, should be fed.

Silage is an especially valuable roughage when pastures are burned and dry. Good quality legume hay or some green colored grass hay should be fed for vitamin A during drouth or at any time cattle are not on green pasture for periods of six to eight weeks.

The use of protein supplements is the key to good performance of the herd and efficient use of other feeds. Non-legume hays, matured pastures, stalk fields and grains do not contain sufficient protein and should always be supplemented with cottonseed meal or other high-protein concentrate. Analyses of pasture forage by experiment stations show that the protein content often declines as much as 50 to 75 percent as the forage becomes dry and mature.

Farm grown grains may be used as needed to supply carbohydrate or total energy in addition to pas-

ture and roughage. The use of grain as a supplement, with protein concentrates, may be desirable when the cattle are not receiving sufficient volume of good quality pasture or roughage or in increasing the fleshing of young purebred animals. However, it should be kept in mind that condition gained through use of grains is much more costly than that from pastures or roughages properly supplemented with protein.

Salt and minerals are essential in digestion, reproduction, growth and general body metabolism. Phosphorus and calcium are the two minerals most likely to be deficient in feeding. Legumes are usually an excellent natural source of calcium. Cottonseed meal is especially high in phosphorus. Trace minerals such as cobalt, iodine and copper are deficient in the feed and forage produced in certain areas and should be supplied in the salt mixture in those localities. A good general mixture for self-feeding in most areas is two parts of bone meal and one part of salt.

The Kansas Experiment Station has recently completed an experiment in which self-feeding salt to steers was compared with no salt feeding. Gains were almost doubled and the amount of feed required for 100 pounds of gain was reduced 50 percent by salt feeding.

It is usually desirable to creep-feed purebred calves or good quality commercial calves which will be fattened on the farm for baby beef. Fast gains are made on a small amount of feed; heifers develop early and purebreds develop good conformation and thick fleshing to bring better prices. A good mixture for creep feeding is: 400 pounds of corn chops or sorghum grain chops, 250 pounds of ground oats, 150 pounds of wheat bran and 100 pounds of cottonseed meal.

When breeding cows are not on good pasture, they need 1 to 3 pounds of cottonseed meal or other protein concentrate. Increasing this amount to 2½ to 3 pounds, per head daily, after calving improves milk flow and makes heavier calves. In addition to the protein concentrate, feed 40 to 50 pounds of silage, or 16 to 20 pounds of dry roughage.

Growing heifers need 1½ pounds of cottonseed meal and 14 to 16 pounds of dry roughage. Farm grown grain may be added to this ration as desired to produce heavier fleshing.

When bulls are not on pasture, they need a daily ration of 4 pounds of corn or sorghum grain chops; 2 pounds of ground oats; 1 pound of wheat bran; 1½ pounds of cottonseed meal; 2 pounds of legume hay; and 10 pounds of non-legume roughage.

The economy of feeding suffi-

cient amounts of essential nutrients was clearly indicated in a recent Oklahoma experiment. In this test, beef heifers were wintered on various rations containing different amounts of protein. One lot was fed a daily ration of one pound of cottonseed cake in addition to hay. Another lot was fed one pound of a mixture of protein and grain to make a 20 percent protein feed which was fed with hay. The lot receiving one pound of cottonseed cake made a winter gain of 68 pounds and produced a profit of $14.93 a head. The lot receiving one pound of 20 percent protein feed in addition to hay lost 14 pounds of weight and sustained a loss of $1.59 a head.

The old Scotchman who said, "I may not make any money feeding these cattle but no one can starve a profit out of them," must have been right.

What Do You Know About Liming?

Condensed from The Maryland Farmer

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As a test of your knowledge and as a means of adding to your supply of basic information, see how many of the following questions you can answer correctly. While some of the answers may be controversial, they represent the combined opinion of soil scientists from Maryland, New York, New Jersey, Ohio and Pennsylvania.

1. Why are some soils acid, some neutral, and some alkaline?

The amount of rainfall largely determines whether the soil will be acid, neutral, or alkaline. In regions of high rainfall, alkaline elements in the soil's exchange complex are replaced by hydrogen (acid) ions from the water. This leads to soil acidity. In regions of low rainfall, the carbonates remain on or near the surface of the soil. This results in neutral or alkaline soil conditions. In the black-soil areas from the Dakotas southward, calcium carbonate deposits are found in the subsoil. In the prairie states, which lie between the areas of high acidity

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and high alkalinity, the soil may be virtually neutral.

2. What is the nature of the acids in acid soils?

The acids in acid soils are largely insoluble humic acids and acid clays. Acid soils also contain small amounts of simple soluble acids, such as carbonic, nitric, sulphuric and phosphoric acids.

3. What is the nature of the bases in alkaline soils?

Slight alkalinity in soils is usually due to the presence of free calcium and magnesium carbonates. Much higher alkalinities are found when sodium and potassium carbonates are present. These may develop naturally in the soil or they may accumulate through the use of irrigation waters that are high in sodium and potassium salts.

4. What changes take place in soils while becoming acid?

The primary change that takes place when a soil becomes acid is the replacement of exchangeable bases by hydrogen. These replaced bases may then be used by plants or leached from the soil in the form of soluble salts. As a result soil acidity increases and iron, aluminum, and manganese become more soluble. Available soil phosphorus combines with these elements to form insoluble compounds. The bacteria that decompose soil organic matter, those that produce nitrate, and those that fix atmospheric nitrogen become less active. The ratio of soil fungi to soil bacteria increases. The working qualities of the soil tend to deteriorate with adverse effects on aeration and drainage.

5. Do plants vary in their capacities to grow on acid soils?

Plants vary widely in their capacities to grow on acid soils? Some, like blueberries and azaleas, grow better on acid than on limed soils. Others, like corn, oats, and timothy, are tolerant of a moderate degree of acidity but will also grow satisfactorily on a moderately alkaline soil. Flax, peas, turnips, and red clover are less tolerant of acidity. Such plants as barley, alfalfa, sweetclover, cauliflower, and most vegetables require a soil pH that closely approaches the neutral point.

6. What is meant by the term, "pH"?

The term, "pH," is used to express the degree of acidity or alkalinity of solutions. The pH value of pure water is 7. Any pH values below 7 are acid and any above that value are alkaline. Soil pH values range between 3 and 10. The lower its pH value, the more acid a soil is; and the higher its pH value, the more alkaline it is.

7. How is the pH value of soil related to its lime requirement?

The pH value of a soil is a measure of the concentration of hydrogen ions that are in the soil-water mixture when the measure-

ment is made. An acid soil also contains "reserve" or "latent" acidity which must be neutralized before its pH value can be raised to the desired level. Soils that are high in clay or organic matter often contain large amounts of reserve acidity, whereas sandy soils do not. This reserve acidity can be determined by treating a series of weighed samples of soil with increasing amounts of lime water and measuring the resulting pH values. After long laboratory experience, a table of factors can be set up for the various soil types by the use of which their lime requirements can be calculated fairly closely from their pH values.

8. How acid may soils become in their natural state?

Under natural conditions in humid regions, the acidity of soils may fall as low as pH 3. In rare instances, it may be even lower. Most acid soils come to equilibrium at pH values between 4 and 5.

9. What are the common correctives for acid soils?

The most common corrective for acid soils is limestone in pulverized, burned, or burned and hydrated form. Certain types of blast-furnace slags and other industrial byproducts of limestone origin are also suitable for correcting acid-soil conditions. Marl and oyster shells are often used. Wood ashes and some of the common fertilizing materials, such as basic slag, cyanamid, bone meal, and nitrate of soda, have alkaline effects on the soil.

10. What are the neutralizing powers of common liming materials?

Calcite, which is pure calcium carbonate, is commonly assigned a relative neutralizing power of 100 because this happens to be the molecular weight of this compound. Dolomitic limestone, which is made up of 54 percent calcium carbonate and 46 percent magnesium carbonate, has a relative neutralizing power of 108. These neutralizing values can be raised by burning the stone and driving off its carbon dioxide. If the oxides then formed are hydrated, the neutralizing values are lowered somewhat, but they are still considerably higher than those of the carbonates.

11. Does continued use of high-calcium lime cause trouble?

The continued use of a very pure calcitic limestone or of its burned or hydrated products, may lead to a marked deficiency of magnesium. The same applies to oyster shells which are very low in magnesium. Most high-calcium limestones contain several percent magnesium carbonate. To maintain a suitable amount of magnesium in the soil, liming materials should carry not less than one-tenth as much magnesium as calcium. Otherwise, it may be nec-

essary to make an occasional application of dolomitic limestone or of its burned or burned and hydrated product.

12. Does continued use of high-magnesium lime cause trouble?

Long-time experiments involving repeated applications of high-magnesium liming materials have not shown any ill effects from their use. Little tendency towards a relative accumulation of magnesium in the soil has been noted in such tests. The rate of loss of magnesium from soils that are being farmed is speeded up by the use of fertilizers. Complete fertilizers are relatively high in calcium, and this aids in maintaining a favorable balance between calcium and magnesium in soils. On a few Maryland soils which are naturally high in magnesium, continued use of dolomite would not be advisable.

13. Is manure of any value for correcting soil acidity?

The ammonia that is liberated from manure during its decomposition in the soil may reduce temporarily the acidity of the soil. On well-drained soil this ammonia is soon changed to nitric acid by the nitrifying bacteria. Since manure also releases bases on decay, it has little permanent effect on soil reaction.

14. Can fertilizer be used in place of lime?

Certain fertilizer materials carry free lime and can be used to advantage on acid soils. For the most part, however, substitution of fertilizers for lime is an expensive way to correct acidity.

15. What effects does liming have on soil micro-organisms?

Under acid-soil conditions most of the changes in soil organic matter are brought about by fungi and actinomycetes. At higher pH values, bacteria are more active. The nitrate-producing and nitrogen-fixing bacteria require a nearly neutral soil for best development. Unfortunately, white potato scab and sweet potato pox are also favored by high pH values so that the nature of the crop and of the micro-organisms associated with it must be taken into consideration in liming recommendations.

16. How does liming affect the physical properties of soils?

Liming an acid soil favors the formation of an improved crumb structure. This is due principally to the increase in crop yields as a result of which larger amounts of roots and other crop residues are added to the soil. The humus that is formed by their decomposition serves as a binding agent in the granulating process in the soil. The lime has an especially important effect on legumes, notably on alfalfa and sweet clover. The deep rooting of these legumes and the large amounts of organic material they contribute, aid greatly in the improvement of structural condi-

tions in the soil.

17. Does liming acid soil increase the supply of mineral nutrients?

Liming an acid soil increases the supply of calcium and magnesium. In addition, microbiological activities are greatly speeded up by liming with resulting increase in the rate of liberation of nutrient elements from the soil organic matter. Further, nitrogen fixation by the nodule bacteria on the roots of legumes and nitrate production are greatly increased. The availability of soil phosphorus and molybdenum is greatly increased. In general, liming an acid soil to a pH value of about 6.5 is desirable for maintaining a high degree of availability of most of the nutrient elements required by plants.

18. What pH value is preferred for most crops in acid-soil regions?

Most of the common agricultural plants in humid regions grow best under conditions of slightly acid soils. Corn, small grains, cotton, tobacco, soybeans, and cowpeas grow well on such soils. Red clover is somewhat more sensitive to soil acidity. Alfalfa, sweet clover, and most vegetables do best at a soil reaction closely approaching neutrality. Taking all crops and conditions into consideration, a pH range between 6.0 and 6.5 is probably the most generally favorable one in acid-soil regions.

19. Does the value of liming acid soils extend to animals and man?

Liming materials supply readily-available calcium and magnesium. By their use the availability of soil phosphorus and nitrogen is increased. As a result plants on limed soils tend to have higher contents of these elements, all of which are essential to animals and man. Liming encourages the growth of legumes which tend to be especially rich in protein, in calcium and phosphorus and in the minor elements that are essential to animals.

20. What are the symptoms of calcium deficiency in plants?

Calcium deficiency results in a stunted plant. It becomes evident first in the new roots and leaves. With further development the plant is no longer able to stand erect. In extreme cases the leaves of the terminal bud curl, turn light green, and eventually die, the tips and margins being affected first. As growth is retarded, a thickening of the stems and often of the lower leaves occurs, which tend to become dark green. The roots are malformed, their tips are blunt and darkened, and they have few lateral branches.

21. What are the symptoms of magnesium deficiency in plants?

The first symptom of magnesium deficiency is a reduction in the chlorophyll content of the

older leaves and a fading from green to yellow. Such a chlorosis develops first in the areas between the veins of the lower leaves. As the magnesium-deficient plant grows older, the color of the areas between the veins varies from whitish in the bottom leaves through yellow in the middle portion of the plant to a normal green at the top. On cotton, lima beans, blueberries, and certain other crops, the interveinal portions of magnesium-deficient leaves is red but the veins remain dark green.

22. On what type of soil does high pH value cause most trouble?

High pH values produced by liming are especially troublesome on sandy soils in humid climates. Such soils have very little buffering capacity and their pH values are quickly raised to relatively high levels with only moderate applications of liming materials. Such soils are likely to contain only very small amounts of the essential minor elements, and the availability of these small amounts is greatly reduced as the pH values rise. This is notably true of manganese, zinc, and copper.

23. When can burned lime be used to special advantage?

Burned lime has a more rapid effect than pulverized limestone. It may be less expensive per unit of lime under conditions in which the liming materials have to be transported considerable distances. Thus 1,120 pounds of burned lime has the same neutralizing value as 2,000 pounds of limestone so handling and transportation costs can be cut nearly in half by its use.

24. Under what conditions is hydrated lime preferred?

Hydrated lime has the advantage that it is more finely divided than pulverized limestone, it is more readily soluble, and it is faster acting. It is a more concentrated product, 1480 pounds of hydrated lime derived from calcite or 1325 pounds derived from dolomite being equivalent to 2000 pounds of pure calcitic limestone. For crops preceding potatoes, hydrated lime is preferred over limestone because there is less danger of undissolved particles persisting in the soil to favor scab formation.

25. What are the advantages of using pulverized limestone?

Pulverized limestone is usually the least expensive liming material. It has a high degree of popularity because of its low cost per ton, the ease with which it can be spread, and its lack of causticity on the skin. For extensive farming it will continue to be the preferred form of liming material. In the more intensive types of farming, notably in vegetable and truck crop production, it often yields to hydrated lime. The same applies to areas that are far re-

moved from the source of supply.

26. To what fineness should limestone be pulverized?

To be of benefit, limestone must react with soil acids. Its rate of reaction is largely dependent on the surface area of the limestone particles. The finer the particles, the greater the amount of surface exposed to solution per ton of material. For quick effects it is desirable to use a product most of which passes a 100-mesh screen. Such a product will react with the soil during the first few months after application to the soil. Limestone particles passing a 20-mesh screen but not passing a 100-mesh screen will dissolve and become available within a year or so. Particles larger than 20-mesh have very slow effects in the soil, and still coarser products are essentially worthless.

27. How rapidly will lime applied at the surface work downward?

The depth and rate of penetration of liming materials from surface applications depend on the kind and amount added, rainfall, soil moisture conditions, and soil type. In Connecticut on fine sandy loam, ten years elapsed following a surface application of two tons of pulverized limestone an acre before the pH value was uniform throughout the upper six inches of soil. In West Virginia a topdressing of 1½ tons of hydrated lime on a permanent sod raised the pH value of the top 1½ inches of soil from 5.2 to 7.0 after a period of thirteen years, while the pH value of the 5- to 7-inch layer was increased from 5.0 to 5.6. These and other data show that liming materials applied on the surface move very slowly to lower depths.

28. Is plowing under of liming materials ever desirable?

If deep-rooting, lime-loving crops are to be grown and the subsoil is acid, plowing under part of the lime and harrowing in the remainder will aid in neutralizing the entire top soil and upper part of the subsoil and may improve yields. For maintenance purposes on soils that are being cropped in rotation and already have a favorable pH value, plowing under lime with a sod or cover crop has advantages both in economy of labor and in speeding up decomposition of the organic materials.

29. If applied after plowing, how well should lime be worked in?

Liming materials applied to plowed soil should be mixed with the soil as soon after applying and as thoroughly and deeply as feasible. The better they are mixed with the soil, the more quickly their value is realized and the less likely they are to be lost by erosion. Allowing liming materials to cake or crust on the surface of the ground before incorporation reduces their effectiveness.

30. How frequently must main-

tenance applications of lime be made?

The need for renewing the lime supply in the soil is dependent upon the kind of soil, the climate, and the cropping system being employed. In general, maintenance applications need to be made every four to six years. On sandy soils more frequent use of lime and lesser amounts per application are required than on the heavier types of soil. The greater the rainfall and the larger the amounts of water passing through the soil, the more frequent the need for lime and the larger the amount required. The higher the intensity of the agriculture and the heavier the application of fertilizer, the more necessary it becomes to lime the soil frequently. The best means of dealing with this problem is to have the soil tested regularly for its pH value.

31. To what crop should lime be applied in general farm practice?

Lime should be applied well in advance of planting the crop that has the highest lime requirement, which is usually some legume hay crop. By this procedure the returns from its use may be greatly increased. For such crops as potatoes and the finer-quality types of tobacco, the soil-borne diseases of which are favored by liming, the lime should be applied after the crops have been harvested rather than just before planting them. Under average farming conditions, lime should be applied whenever a convenient opportunity is presented, assuming that pH tests show that it is needed.

Relative Neutralizing Powers of Liming Materials—

Liming materials	Relative neutralizing powers	Pounds equivalent to one ton	
		$CaCO_3$	CaO
Calcium carbonate (limestone)	100	2000	3570
Calcium oxide (burned lime)	178	1120	2000
Calcium hydrate (hydrated lime)	135	1480	2640
Dolomitic limestome	108	1850	3330

Improving Broiler Growth

Condensed from American Poultry Journal

J. R. Couch

WORK on the use of APF (Animal Protein Factor) concentrates in broiler rations was started in the laboratories of the Poultry Department at Texas A. & M. College the Spring of 1949. The ration used in these studies was made up of soybean oil meal and ground yellow corn plus the required minerals and vitamins. Vitamin B12 was added in the form of an APF concentrate.

Crossbreds chicks (Single Comb White Leghorn females & New Hampshire males) and straight New Hampshire chicks were used in the feeding tests. Both of these types of chicks have been used for the production of broilers. The birds were maintained in batteries with raised screen floors in some experiments and in pens on litter in others.

From the beginning of the experiments, there was little question that it was necessary to add a source of vitamin B12 to this all-vegetable protein (corn-soybean oil meal) ration.

New Hampshire chicks fed the corn-soybean oil meal ration without APF weighed only 1¼ lbs. at 10 weeks. If the ration was supplemented with APF (source of B12), the New Hampshire chicks weighed 2½ to 2¾ lbs. at 10 weeks of age.

Best results were obtained by feeding 3% dried whey and ½% APF (source of aureomycin and B12) in the corn-soybean oil meal ration. New Hampshires, White Plymouth Rocks, and Indian River Crosses were used in this test.

The average weight of broilers in the test was 3 lbs. at 10 weeks of age, and 33 lbs. of chicken were produced per 100 lbs. of feed; 200 to 280 birds were fed in each group. There was no difference in the weights of broilers from each of the breeds and crosses mentioned above. It should be pointed out that the average weight of 3 lbs. per bird was a pen average for both cockerels and pullets.

Another very significant point about the test was the low mortality experienced. Less than 1% mortality occurred to the time the broilers were marketed.

The aureomycin APF has not only tended to improve livability, but has also decreased the percentage of runts in broilers fed this APF.

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In addition to the above, aureomycin APF has improved the feathering in all cases. Broilers fed APF (source of aureomycin and B12) have fewer pin feathers, and the feathers have a better sheen or gloss. An improvement in the feathering of turkeys fed this source of APF over that of those where aureomycin was not fed has been of particular interest.

R. L. Atkinson, research assistant in the poultry department, has studied the value of APF, antibiotics and B12 as supplements to an all-vegetable protein (corn-soybean oil meal) turkey ration. Broadbreasted Bronze turkey poults were used in these experiments.

Best results were obtained by feeding the APF which contained aureomycin and B12. Turkeys fed the aureomycin APF weighed about 4 lbs. at 8 weeks of age, and this was about 25% more than those poults not fed a source of APF. Good results were also obtained by feeding penicillin and vitamin B12. The feeding of an antibiotic and vitamin B12 improved feed efficiency, livability, and feathering, and there was a smaller number of runts in all groups where the APF containing an antibiotic and B12 was fed.

Dr. J. H. Quisenberry, head of the poultry department, Texas A & M College, has recently completed a test with laying hens in which a "high efficiency ration," composed of soybean oil meal, corn and milo, was fed. This ration was supplemented with vitamins and minerals. Vitamin B12 was fed as an APF concentrate. The duration of the experiment was 6 months.

Again it was necessary to add vitamin B12 to the all-vegetable protein (soybean oil meal and grain) ration. When this ration was fed unsupplemented, egg production decreased, and the eggs failed to hatch. However, when APF (source of B12) was added to the ration, egg production was approximately 65%, for the test period. Hatchability of fertile eggs was above 90% for the last 3 months of these tests.

Of what importance are these findings to the poultrymen and to the feed manufacturers? It means that we can use a simpler, less complicated feed formula and still obtain good results. From all of the recent work at the various experiment stations, it is apparent that antibiotics have increased the growth of birds when these drugs are fed as a part of the APF concentrate.

We have tested other antibiotics including penicillin and streptomycin. Penicillin gave results about as good as those obtained by feeding aureomycin, and both penicillin and aureomycin gave better results than streptomycin.

Bovine Trichomoniasis

Condensed from Guernsey Breeders' Journal

David E. Bartlett, D.V.M.

DEVELOPMENTS of the past few years are notable in the research on bovine venereal trichomoniasis (trik-o-mo-ni-a-sis) carried out at veterinary research institutions in this and other countries. Techniques are now available to handle this cattle disease in a positive manner. Trichomonad-infected herds have been and are being freed of this disease and many valuable, previously infected bulls have been returned to unrestricted service after being successfully treated and cured of their trichomonad infections.

Never - the - less, trichomoniasis cannot yet be regarded as a no longer serious disease problem, since doing something constructive about an affected herd is a long, sometimes tedious, process. The losses from temporary infertility of females already infected at the time of diagnosis cannot be altered. These infections must be permitted to run the course until immunity develops and the causative organisms disappear. There is no proved treatment for females; self-cure must be awaited.

Treatments for infected bulls have been developed but they are unavoidably long term procedures which are necessarily time-consuming and thus expensive. Only valuable bulls are worth the attempt at treatment. Today, the technical means to cure most bulls exists. Ten years ago the universal recommendation was to slaughter, promptly, infected bulls; then, the disease in males was accepted as hopelessly incurable.

It is less than 25 years since bovine venereal trichomoniasis was first recognized as a distinct disease, but we have no reason to believe that this infection came so recently into existence. Earlier records reveal herds that exhibited the typical clinical picture; organisms which may reasonably be presumed the same had occasionally been noted in the genitals of cattle. In 1928, in Germany, a veterinarian by the name of Riedmuller, studying infertile cattle, noted the presence of a single-celled animal parasite in their genitals and published a good description of this "new" disease. He applied the name *Trichomonas foetus* to the protozoan.

Since Riedmuller's report, a great volume of facts has been accumulated from workers of many

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nations. Veterinary institutions in Germany, Switzerland, England, and North Ireland have been particularly active. Bovine venereal trichomoniasis was—and still is today—a first ranking animal disease problem to those and the other European people because of the nature of their cattle husbandry. Their herds are small and frequently community or "communal" bulls are used to service all females of an area. Thus, the entire cattle population of a sizeable region may be simultaneously involved. Promiscuous breeding is the rule, and a situation extraordinarily favorable to dissemination and perpetuation of trichomoniasis exists.

In the United States, workers of many universities and research organizations have contributed their studies. The Schools of Veterinary Medicine at Cornell and the University of Pennsylvania, the Department of Veterinary Science of the University of Wisconsin, and the School of Hygiene at Johns Hopkins have been very active. The Bureau of Animal Industry of the U. S. D. A. at the Agricultural Research Center, Beltsville, Md., maintained a special herd devoted to the exclusive study of this disease for more than 10 continuous years.

Since almost all commercial and pure bred herds in the United States are essentially stable breeding units, a situation rather different than that in Europe developed in this country. Here the disease is usually found operating on a herd basis. It has not become so widely disseminated throughout our cattle population. However, many individual affected herds have become infected as a result of inadvertently introducing new bulls already infected in their herds of origin, or, on adding recently exposed and infected females which return to heat and are served again on arrival in previously uninfected herds. Financial reverses suffered by individual owners of infected herds are always critical.

One typical dairy herd of about 65 breeding females, of which the records are available for five years prior to the time infection was introduced, during the three years infection was present, and for two and one-half years after the infection was eliminated, furnishes an excellent measure of just how much trouble may be encountered. Not recognizing the cause of difficulty, the management of this herd attempted to maintain the output of milk—unsuccessfully—by adding to the numbers in the milking line. Roughly, they, (1) increased the herd by more than 10 per cent, (2) doubled the number of replacements per year, reaching 23 one year when the total herd numbered 77 and, (3) more than tripled the number of females discarded per year as un-

profitable. Despite these moves (1) they got only about two-thirds as many calves per year, (2) the time between first service and becoming pregnant or necessary disposal as unprofitable, during the period the herd was infected, jumped from an average for all females of one month to almost five months, (3) the carefully calculated breeding efficiency of the herd which was between 85 per cent and 90 per cent before and after the episode of trichomoniasis, fell to between 50–60 per cent during two years of the period of infection.

It may now be said with assurance that under natural conditions bovine venereal trichomoniasis is transmitted almost exclusively through direct sexual contact. Under practical conditions it has been shown unnecessary to isolate infected animals from those that are susceptible. However, trichomoniasis is readily transmitted to females by artificial insemination if infected bulls are employed as sources for semen. Also, the disease may easily be transmitted between animals by directly carrying infective genital secretions on hands or on instruments. Special care must be taken to guard against such purely artificial, mechanical transmission whenever presence of trichomoniasis is known.

Most infected females show remarkably few signs of this disease other than in their breeding histories. All previously uninfected heifers or cows are susceptible. When first served by an infected bull there is no interference with their becoming pregnant, but, within a few weeks or sometimes months, the developing fetus is killed by the trichomonads introduced at the time of service. Fetuses the size of a jelly-bean, a mouse, or, rarely, the size of a rat may be aborted along with the membranes, from five weeks to three months after service. Death of the fetus occurs most frequently in its early stages and the fetus may be so small as to pass unobserved. In many females no inflammation of the external organs is apparent and no discharges are observed. After death of the fetus, heats may occur regularly and the infection continue, matings being unsuccessful for periods up to six months. By then, the female has become immune and is able to remain pregnant and deliver a normal calf at term—but, a long time behind schedule. Unfortunately, females do not remain immune all their lifetime. For a year or so following recovery, they may be resistant to exposure incident to services of a trichomonad-infected bull and settle regularly. Then, their immunity diminishes and if exposed by an infected bull they go through a second period of infection, being again rendered temporarily unproductive.

An occasional female may neither return to heat nor abort her trichomonad-killed developing calf. Rather, she may give outward signs of pregnancy and not return to heat for six months, nine months, a year or more. Such females may have an accumulation of pus within the uterus—a few pints to five gallons—that teams with millions of trichomonads in every drop. Such females may or may not periodically discharge small quantities of the slimy, odorless pus from their otherwise normal appearing genitals.

It must be remembered that infection of the female eventually runs out and is followed usually, temporarily, by immunity.

Trichomonad infection of the bull is permanent, although externally the infected sire shows nothing. There is no way to tell by merely looking at a bull whether or not he is infected. His sexual organs are normal and he carries out his part of the sex act in a normal manner. His conception results, when he serves females that have been previously infected and become immune, may be excellent. However, with those females that are not immune, the results are almost consistently failures. A five or six months session of infertility usually follows his services in these latter females.

Diagnosis of bovine venereal trichomoniasis is on a herd basis and consists of isolating the causative organisms, *Trichomonas foetus,* from the genitals of any male or female herd member. A diagnosis must never be made nor treatments undertaken until presence of trichomonads has been proved, because there are other disease conditions affecting cattle remarkably similar in clinical picture. In recent years, experimental studies of diseased animals have determined when to take samples and how to take samples, and experimental evaluation of diagnostic methods has given confidence to the veterinary diagnostician confronted with a herd suspected of this disease. Herd diagnosis is relatively uncomplicated. Occasionally, being certain that a particular bull is free from the disease constitutes a difficult problem. However, it is a certainty that if he is infected this fact will be consistently reflected by failure of those females he serves to become recognizably pregnant, particularly the heifers served as virgins. A diagnosis of bovine venereal trichomoniasis cannot be based on a poor breeding record; but, confidence in freedom from infection is justified in the presence of an exceptionally high breeding efficiency, especially where heifers are involved.

Successfully handling trichomonad-infected herds requires three major coordinated steps:

1. Discontinuing promptly the use of infected bulls. This is just

as promptly followed by cessation of further transmission of infection to breeding females.

2. Breeding those non-pregnant females which may still be harboring infection without endangering uninfected bulls. Artificial insemination is sometimes a highly valuable part of the program at this point.

3. Taking advantage systematically of the period when previously infected females are sure to be free from infection and returning these females, if desired, to unrestricted natural service. It has been shown that regardless of prior infection status, females are free from infection and may be safely sent to uninfected bulls after completing a full-term pregnancy, passing at least two heats and waiting 90 days after normal calving.

Principles involved in this system of management practices have been widely and successfully used with consistently satisfactory results in numerous herds under farm conditions where the opportunity for close scientific observation did not exist. In the case of seven herds close to Beltsville, Md., opportunity was afforded for close supervision. In every instance these herds are still free from infection after from three to five years.

Much effort has been spent for obvious reasons in attempts to develop means of salvaging infected bulls through treatment. After a large, discouraging, and costly experience of experimental failures, three methods have evolved which have altered completely the necessity for infected bulls to be slaughtered as incurable and unprofitable. The first of these treatment methods was developed by Dr. R. Abelein of the Veterinary School of the University at Munich in Germany during the early part of World War II. Abelein reported that a material called "Bovoflavin-Salbe" had been used on over 100 bulls with apparent good success. However, little follow-up had been possible and accurate appraisal of this treatment's degree of effectiveness was never completed. Promptly on the close of hostilities in Europe, our Bureau of Animal Industry requested that an investigator in Germany ship samples of "Bovoflavin-Salbe" to the Research Center at Beltsville, Md. Work was immediately undertaken to evaluate this product under the most critical conditions possible. Only 10 bulls could be obtained for treatment experiments and nine of these bulls were unquestionably cured. A considerable additional number of bulls have been treated by veterinary practitioners in the United States under the less critical conditions of practice—almost all with apparent success.

The second of the treatment methods was developed at the

Zoological Division, Bureau of Animal Industry, Agricultural Research Center, U. S. D. A., at Beltsville, Md. Although the report of success in Germany had reached this country in the early World War II. years, it was found impossible to obtain samples of their material. Consequently, another line of attack was studied by the present writer. About 20 infected bulls were treated with large doses of an iodine compound and a little more than half of these bulls were cured. More would probably have been cured had bulls unsuccessfully treated always been retreated.

It is of interest to note that incidental to the course of bull treatment experiments conducted at Beltsville, bulls totaling in value not less than $27,000 were cured and returned to unrestricted, successful service in their herds! In no instance did trichomoniasis reappear.

The third treatment method was reported in 1949, by Dr. Emil Hess of the Veterinary School at Zurich in Switzerland. His procedure involved douching of the infected bull with a solution of hydrogen peroxide under very high pressure and employed a specially constructed apparatus. The reports from Switzerland have been very encouraging. Success was not complete in a small group of bulls treated in this country.

The chance today for successful treatment of an infected bull is not an unreasonable gamble. It is largely the fact that an extended period of careful observation is necessary after the treatments have been applied that makes the treatment costly.

Research has made real accomplishments in these recent years. The owner of a herd experiencing reproductive difficulties need no longer become panicky on being told by his veterinarian that the cause of encountered difficulties is bovine venereal trichomoniasis. There is no excuse for indiscriminately selling out entire herds or attempting to live with this disease by temporary expedients such as restricting services of infected bulls to previously infected females. There is no disgrace in a herd's having trichomoniasis, but, there is disgrace—and ruin—in keeping it. Discrimination against a previously infected herd that is no longer infected is not justified.

Positive improvements in the situation among the females can be shown almost immediately upon recognition of this disease. Within six months reproductive efficiency can be restored to near normal, and within 18 months the females can be declared free of infection. Most bulls having exceptional value for breeding purposes can be cured with recently developed methods now available.

Bulls that are not worth three times their butcher value should usually be promptly slaughtered. All the necessary facts have been made available to your veterinarian. Today, an outbreak of bovine venereal trichomoniasis can be beaten if there is cooperation and mutual understanding of the problem by management and veterinarian, and determination to stay with the job until it is done.

Farm Wiring Goes Underground

Condensed from Capper's Farmer

Ralph L. Foster

MANY new farm wiring systems are being laid underground. Two developments make this possible. One is the increasing availability of a synthetic cover for electric cable that resists moisture, insects, rot and corrosion. The other is designing of low-cost, laborsaving small trench diggers.

Burying electric wires on farms is not a new idea. It has been done frequently where soil is free of rock and heavy gravel. But the wires were put in metal conduit. That ran up the cost. A new, tough, long-lasting plastic-covered cable approved by the Underwriter's Laboratories, requires no special tubing. Moisture, fungi, and soil bacteria can't get in it.

Condensation, ammonia fumes from manure, oils, greases and fungous rot, common to barns and other farm buildings, shorten the useful life of ordinary rubber and fabric-covered cable. When research men found a sheath for electric wire that will resist ordinary above-ground farm wear they also had one that lasts underground without metallic covering.

Farmers who are putting their wiring systems underground are looking for safety, permanence, convenience and sightliness. Buried cable can't load up to the breaking point in ice storms. That is a big reason why the system is gaining popularity so fast in Minnesota, the Dakotas and parts of Iowa. Frequent windstorms that blow down poles and snap overhead wires are turning thoughts of farmers and electrical contractors to underground installation in storm-frequented areas in the southwest.

No lines are in the way to snag

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tall machinery when cable is buried. Only exposed wires are those leading from the high line to the yard distribution pole. Layout is simplified. Yard pole need not be spotted so carefully to avoid running cables over buildings or thru trees. Sightliness alone has decided some folks in favor of underground wiring.

Lightning damage is less of a hazard. If the lead-in does pick up a lightning charge it is more likely to be lost in the ground before it reaches a building. Should any building catch on fire, service to other structures is not broken. Numerous farmers with overhead wiring systems are running an underground line from the yard pole to the electric pump to insure water pressure in event of fire.

Cost would have been about the same for both types of wiring for a 700-foot line that Marion Snyder, La Salle county, Illinois, ran from his barn to a pump at the farm pond. He chose the underground method and laid the water pipe and cable in the same trench. The ditch was dug with a jeep trencher and filled with a scraper blade on his tractor.

There was only a few dollars difference between overhead and underground figures in the contractor's bid for wiring Ray Benton's farmstead, Edmunds county, South Dakota. Benton needed 225 feet of trench to reach all of his 9 buildings.

A contractor, who has installed many farm wiring systems in Minnesota and South Dakota, believes underground systems are cheapest in the long run. However the higher cost of cable and expense of digging trenches looked big to farm owners. The contractor couldn't do anything about the price of cable but he did do something about the cost of trenching. He built a special trenching plow that digs deep and fast. It is pulled by a small tractor and is controlled hydraulically to insure uniform depth. He fills trenches with a dozer blade on the same tractor. Another contractor uses a jeep trencher and covers cable with a hydraulically controlled blade. These special tools help keep costs down.

Cable should be buried deep enough to be safe from mechanical injury. One engineer suggests putting an inch of sand in the bottom of the trench before laying the cable and then covering with more sand before the trench is filled. This, he believes, provides better drainage in heavy soil and protects the cable from shifting action of soil when it freezes and thaws. Where cable goes under a driveway or other places subject to heavy traffic it may be given further protection by laying heavy planks over the sand before filling in with dirt.

Slack should be allowed for frost cracks or soil heaving. Where

cable goes thru a foundation it may be looped to prevent stretching if the foundation or soil should shift. Cable thru a foundation should be run in a pipe or conduit. Stuff ends of the pipe tight with non-hardening calking compound to keep out moisture. Where cable must go up a pole or side of a building it should be placed in pipe or conduit.

If you are planning an underground installation look for cable that carries the Underwriter's Laboratories USE stamp of approval. USE stands for Underground Service Entrance cable. A widely used cable is covered with a 3/64-inch neoprene packet. A contractor who has laid several hundred thousand feet of this line in farm wiring systems says he has had no reported cases of failure.

USE cable is made in single or multi-conductor types. In general, single conductor cable makes the least expensive installation, according to the Farm Electrification Bureau of the National Electrical Manufacturers Association. USE cable is also suitable for overhead wiring between buildings.

Cable large enough to carry the estimated future load of the farm is doubly important in underground installations. It costs more to replace underground wire. Therefore, plan your system for permanence. Future electrical need must be calculated for each farm. Don't skimp on wire sizes.

A lot of farm wiring strung 15 to 20 years ago doesn't have current-carrying capacity for all the electrical jobs that have since been installed. It is the farmer whose electrical system needs remodeling for more capacity, or whose farm is yet to be electrified, who can afford to consider the merits of underground wiring.

Blood Test

Which of two dairy bulls actually sired a calf can be determined by a blood test. Next it may be possible to predict value of a dairy calf by testing her blood. Substances called cellular antigens in blood of cattle hold the key, according to Ohio Experiment Station. Certain of the antigens in blood cells of bulls are found in the animal's sperm cells. All antigens in blood may also be in sperm. Workers seek a relationship between these antigens and milk-producing ability, or other important inherited characters.

—Cappers Farmer

Sulphur Answer To Potato Scab

Condensed from The California Farmer

Joe Crosby

CONTROL OF potato scab, a soil-borne disease that annually lowers the quality of thousands of tons of California tubers, and which has rendered a big acreage in the State unfit for potato production, appears to be easily accomplished by the simple process of applying sulphur to the soil, thereby lowering the pH—increasing the acidity—to a point where the scab organisms are killed.

For the past three years, members of the University of California and Kern County Agricultural Extension Service have been doing a lot of work to find out whether sulphur will eliminate the scab, its effect on yield, and whether the benefits are temporary or permanent.

Thus far everything looks exceedingly good; definitely stacking up in favor of the sulphur applications in every respect.

The progress of the work was outlined at a meeting held at the Cotton Experiment Station, Shafter, Kern County, recently. The nearly 100 growers who attended were much impressed with the results to date. It's safe to assume that many of them will start treating their land with sulphur right away, despite the fact that the research workers warned that it is yet too soon to draw final conclusions.

The S. A. Camp Company, on whose land the tests are being conducted, is so well satisfied with the findings that it has applied sulphur to about 1000 acres, it is reported.

David N. Wright, county farm advisor, and Dr. John W. Oswald, of the Division of Plant Pathology, Davis, explained the work they have been conducting about as follows:

In February, 1948, 12 acres of scab-infested land on the S. A. Camp ranch near Shafter, were divided into plots and treated with four different applications of sulphur. The land had an initial pH of about 7.5 and in the first year an attempt was made to establish permanent strips of pH 6.0, 5.5 and 5.0 by the application of 1000, 1500 and 2500 pounds of sulphur per acre, respectively. A fourth strip was treated with 80 per cent sulphuric acid, applied at the rate of 2000 pounds per acre. The strip receiving 1500 pounds of sulphur per acre was

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given an additional 1000 pounds in September, 1948.

Each strip was 800 feet long by 20 feet wide and contained eight rows of which the center two were used for the results. The soil sulphur was broadcast and disked into the soil. The acid was sprayed on the surface from a tank truck and also disked in.

Three successive crops, 1948, 1949 and 1950 have been grown since the original treatments. The degree of scab was measured by the percentage of tubers marketable. Any potato with over 5 per cent of its surface covered with scab is considered unmarketable.

The 1948 crop received little benefit from the sulphur, although the pH on all treated plots was somewhat lower than the check. A remarkable control of scab was obtained, however, in the second and third crop—1949 and 1950—where 2500 pounds of sulphur per acre had been applied. On this heavy application plot only 29 per cent of the potatoes were marketable in 1948, whereas 90.4 per cent were marketable in 1949 and 92 per cent in 1950.

This high degree of control was obtained even though diseased tubers in the checks had gone from 23 per cent marketable in 1948 to only 11.8 per cent in 1949 and 26 per cent in 1950. The increase in marketable potatoes in 1950 in the untreated plots was attributed to the harvest being about two weeks earlier than in the previous year.

Wright and Oswald pointed out that these results indicate scab can be reduced effectively in the first year by increasing soil acidity, but is not controlled effectively until the second year. Future data will determine how long the control gained in the 2500-pound sulphur treatment will last.

Both agreed that a pH of 4.5 or below is necessary for any appreciable effect on the disease. However, yields in 1948 and 1949 were not significantly reduced at pH's as low as 3.4.

It is important to note that the pH of the heavy sulphur strip averaged 3.7 at harvest and total yield was no different than checks on either side at pH 7.0. In other words, total yield ranged better than 200 sacks per acre, with more than 90 per cent marketable.

A second set of sulphur-soil trials was started in September, 1948. Application rates were about the same as those made in the previous February. However, in the absence of any appreciable rainfall, the soil remained dry until the preplanting irrigation in February. The pH of all treatments remained neutral until February and then dropped abruptly. The strips receiving the 2500-pound application dropped from pH 6.8 to 4.5 in 40 days. This plot brought out the fact that sulphur in the soil will not be

changed by the sulphur bacteria unless abundant soil moisture is present.

Wright and Oswald pointed out that since it apparently takes two years to renovate scabby land with sulphur, it seems advisable not to crop the land to potatoes the first year after treatment. No control of scab could be expected and the infestations of the fungus would be building up in the soil. The danger of encountering sulphur damage on spuds would also be eliminated. They think an excellent crop of cotton can be grown on sulphured land in the first year of treatment.

They warned growers that specific responses to sulphur on soil types other than the Delano fine sandy loam on the camp ranch are not known. This is being studied.

It was also forcefully explained that older potato fields have a pH of around 6.0 due to the application of ammonium sulphate fertilizers which tend to make the soil more acid. On fields with a pH of 6.0, it is not likely that 2500 pounds of sulphur could be applied safely. Many instances of poor stands and yields have been reported where sulphur applications have been too great. Thus, it is important that the soil pH be determined before making any treatment.

Control of Rocket and Mustard

Condensed from Farm Research

S. N. Fertig

IF USED properly and applied at the right time, 2,4-D may prove highly satisfactory for controlling yellow rocket, mustards and other susceptible weeds in winter wheat and spring-planted small grains. Plants of all these crops may be injured if too heavy applications are applied, or the stage of growth is not watched carefully. The injury will be reflected in discolored kernels, light weight grain, and lower yields.

Experiments conducted at Ithaca in 1948 and 1949 on winter wheat show reductions in yield of as much as 40 per cent where concentrations were too high or treatments applied too late in the season. The reductions occurred with less than ½ pound of 2,4-D per acre of the ester or amine forms.

Pre-emergence treatments on

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fall-planted wheat were not satisfactory. No injury was observed but weed control was very poor. Treatments applied one week, two weeks, and one month after planting gave increased control as more weeds had germinated at the time of treatment. The most satisfactory concentration was 0.3 to 0.4 pound acid equivalent per acre. Effective control of yellow rocket, which had germinated at time of treatment, was obtained. The desirability of fall treatment depended upon the number of seeds that had germinated and upon whether a legume seeding was to be made in early spring. Where seedings were to be made, fall application offered the only opportunity of reducing weed competition and preventing reseeding of such serious pests as yellow rocket.

In some sections of the State, farmers are treating small grains where legume seedings have been made with little or no injury to the legume. The final results would appear to depend on several factors, such as stage of growth of the small grain and the weeds, the amount of protective canopy offered the legume by the growth of the crop and the weeds, the concentration of 2,4-D and the commercial product used, as well as temperature and rainfall after treatment. In any event, however, it is a hazardous undertaking, and with the difficulty of establishing legume seedings, the low percentage of legumes found in mixed stands and the high cost of seed, failures cannot be invited. For the average farmer they come often enough without 2,4-D adding to them.

In 1948 increased yields were obtained by using 0.4 pound per acre of 2,4-D applied in the fall when the wheat was 3–5 inches tall, with no visible injury to the crop. Weed competition was reduced by 75–80 per cent. In 1949, yields were reduced slightly by the same concentration at the same stages of growth and the percentage of weed control was not so high. The reason for these different results in the two years is not easily explained, but is typical of those frequently encountered in using 2,4-D. Since, however, definite yield reductions were obtained, growers should be cautioned against using 2,4-D at just any stage of growth and at higher than necessary rates.

If fall treatments are to be made, the results would indicate that treatments should be delayed until the maximum number of weeds have germinated. However, the wheat should have not more than 3–5 inches of growth. Treatments applied later in the fall resulted in yield reductions. The rate should not exceed 0.4 pound per acre, and 0.3 pound was found highly satisfactory for controlling yellow rocket.

Treatments applied 3 months,

5 months, and 6 months after planting (December, February, and March) were not effective for the control of the weeds present, regardless of the concentration used. Rates of 6.4 pounds per acre were no more effective than 0.4 pound. Since 2,4-D is a translocated spray, it, or its effect, must enter the plant and be transported through the conducting system to be effective. With the plants in a dormant condition neither is believed to have taken place. The mixing and handling of spray material and operation of equipment are other objectionable features of winter treatment.

For spring application and where seedings are not made, treatments should be applied before the wheat is fully tillered. The most resistant stage of growth, based on yields, was the early jointing stage followed by the early boot stage. However, in trying to establish a seeding after treatment, these dates were considered much too late. It is realized that in some instances excellent seedings have been obtained when the legume was sown as late as mid-April. However, the chances are much greater when the date is mid-March or earlier. The degree of injury from spring treatment is usually low but increases with later growth stages. Spring treatment before the early jointing stage would be preferred to fall treatment where legumes were not being seeded. The degree of injury is lower and, since more weed seeds have germinated, the control is better.

Wheat yields would indicate that treatments applied in April, May, and June, when the plants were in the boot and heading to bloom stages, caught the plants at the most susceptible periods of development.

It is not possible by use of 2,4-D to get 100 per cent control of yellow rocket or any other weeds common to the small grains. However, the sand can be reduced, seed formation can be prevented, and, over a period of years, satisfactory control can be obtained.

Why Paint Sow's Belly Red?

Condensed from New Jersey Farm and Garden

Paul C. Nordloh

EACH year we lose about one-third of our growing pigs, many of them from nutritional anemia, which is a lack of sufficient hemoglobin or red corpuscles in the blood. The principal ingredient of hemoglobin is iron which is one of the most widely distributed of all minerals. But in order to use iron in making hemoglobin, the animal body needs copper, which is not so widely distributed.

That is the underlying reason for painting the sow's belly with a solution of copper sulphate—to supply the minute amount of copper needed for suckling pigs. Mother Nature never intended that someone should go around painting sows' bellies red. Animals were supposed to get the nutrients they needed in their feed.

Ultimately, we may find that like nutritional anemia, Bang's disease, mastitis, foot and mouth disease—in fact, all diseases—gain a foothold simply through fundamental nutritional deficiencies, perhaps a deficiency of one or more of the trace minerals—iron, copper, cobalt, manganese, iodine and zinc.

We hear on all sides that there is no such thing as a trace mineral deficiency in this or that area. No one can reasonably make that statement unless he has made a thorough, spectographic analysis of all soils in any given area—and who has?

On the other hand, there are deficient animals in all areas. There are sows that lose their litters, dairy cows that have difficulty in breeding, beef animals that don't make the gains they should. These animals may not be total losses, but they are not as healthy and thrifty as they might be if they were supplied with all nutritional elements in optimum quantities. They are suffering from a hidden hunger that no amount of ordinary feed will satisfy.

Man has a propensity for messing things up. He develops new strains of important feed crops to give him higher yields. That's good as far as it goes. But it is depleting our soil in a way that the application of just nitrogen, potash, and phosphorus cannot remedy. While we may be producing more corn, for instance, the corn is deteriorating in quality. The average protein content of the

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Sea Isle City, New Jersey, October 1950

old open-pollinated corn was 9.5%. The average of our current hybrid corns is only 8.5%—a decrease of 11%. Our corn is less nutritious than it used to be. It makes fat, but it doesn't make growth.

The same thing is true of wheat. When our country was young we raised a lot of hard wheat in Ohio. Hard wheat is rich in protein. Today our hard wheat comes from the High Plains area where the soils are younger and richer in minerals. Today, Ohio is a soft wheat state. Soft wheat is mostly starch It is good for cakes and pastry, but it doesn't contain the protein that at one time made bread the "staff of life." It contains only about 10% protein, whereas hard wheat from the Northern Plains States contains over 15%.

The same measure of "success" that has characterized our development of plant life also applies to our development of livestock. We have improved our dairy cows so that the average cow that produced 215 pounds of butterfat a year in 1906 at the start of D.H.I.A. records is now producing close to 350 pounds of butterfat a year. We expect our hogs to reach market weight in less than 180 days from the time of farrowing. We look to our hens to lay 160 eggs a year, whereas only 50 years ago the average was less than 75.

But at the same time that we have been improving our crop and livestock strains, we have been neglecting our soils. Many of the soils that could support the livestock of 50 years ago can't support the high producing animals of today. Only recently have we been attempting to do something about it.

In an important study made at Rutgers on the mineral content of vegetables grown in different areas of the country, the variations were almost unbelievable. One sample of tomatoes, for instance, contained 1,938 parts of iron per million. Another had only *one part* of iron per million! While this was the extreme variation, there were similar differences in other vegetables and with other minerals.

The question naturally arises, "Why are these trace minerals so essential? What is their role in animal nutrition? What is the connection between them and the enzyme, vitamin, and hormone functions?"

The picture is still far from complete. But if we add all we do know about enzymes, we find that it is the trace minerals, to a large extent, which help make possible the proper functioning of the enzymes, as well as the vitamins and hormones. These are the basic activities of life.

We have all seen or heard the word "enzyme." In layman's lan-

guage, an enzyme is an activator or "doer." It carries on one of life's processes without being used up in the doing. There are billions of these enzymes in the animal body. They are extremely small. You can put 5,000 of them on the point of a pin without overcrowding. And each of them has a separate job to do.

For instance, the conversion of starch into sugar, the simplest of all nutritional jobs, requires the functioning of 50 different enzyme systems! Multiply this by the extreme complexity of all the activities of life—the moving of muscles, the digesting of food, the pumping of the heart, the circulation of the blood, the digesting of feed, the selection of nutrients, and the building of them into muscle, bone, blood, milk, wool, eggs—and you begin to see how essential enzymes are. It is vital that they function perfectly.

The enzymes, vitamins, and hormones take the feed—grains, grasses, forages, proteins, and other feeds the animal eats—break them down into their various nutrients, then build these nutrients into activity, growth, repair, reproduction. In turn, the enzymes, vitamins and hormone systems are largely "supervised" by the trace minerals—iron, copper, cobalt, manganese, iodine, and zinc.

The enzymes also hold the key to the proteins. To be utilized, the proteins must be broken down into the amino acids. The enzymes do this. No feed contains all of the 30 or more amino acids that nutritionists have discovered. But if feeds contain the so-called essential ones (essential because they must be supplied in the feed) the enzymes can go to work on the others so that all are present for a complete, rounded-out nutritional job.

Because they underwrite the basic life functions (at least so it seems to the writer) it is small wonder that trace elements have produced such phenomenal results in livestock experiments in recent years.

For instance, in a hog experiment at Cornell University, the addition of trace elements to an otherwise ideal hog ration (traces of cobalt, iron, copper, and manganese) increased the average *daily gain* of pigs by two-tenths of a pound. This is an increase of 25% in the rate of gain. At the same time the feed required per 100 pounds of gain was cut 8%, from 425 pounds to 393 pounds.

In Wisconsin, on a flock of 1,300 sheep that for no apparent reason had dwindled to 200 between lambing and fall, a mixture of iron, copper, cobalt, manganese, and iodine, mixed with salt, completely reversed the situation. The sheep immediately perked up, and in the following year the death losses were zero and all but

three lambs brought the top market prices.

Too long have we looked upon trace elements from the standpoint of animal deficiences. It is more logical to look upon them from the positive side of greater gains, more and healthier young, greater milk production, lower feeding costs, and greater profits.

There are different methods of supplying the trace elements. Some mix it with feed. Others supply it in a mineral mixture with ground limestone as a base. Some are trying to introduce it to forage and feeds through the soil itself. A logical method of feeding is with salt, the universally needed major mineral. With salt as a carrier there is a constant, uniform intake of trace minerals.

By keeping trace mineralized salt free choice before livestock at all times, you have the assurance that your livestock will be healthier and thriftier—and will return maximum profits for you.

Abortion in Sow Herds

Condensed from Breeder's Gazette

Dr. L. M. Hutchings

WHAT a disappointment it is for a hogman to go out and find premature, stillborn, or weakling pigs. As a rule, his profit depends on raising more than five pigs per litter, and he can't do it that way. Chances are his trouble is caused by swine brucellosis, a disease that can be controlled by taking certain measures to obtain and keep an uninfected herd.

Brucellosis in swine is caused by *Brucella suis,* a species of bacteria closely related to *Brucella abortus* in cattle and *Brucella melitensis* in goats. These germs produce undulant fever in man. They are readily killed outside the animal body—by sunlight, disinfectants, and pasteurization—and will not permanently contaminate premises or pastures. Cattle and other farm animals may become infected with the swine type of brucellosis, but not frequently.

On the other hand, swine have considerable natural resistance to the bovine type of brucellosis. *Brucella melitensis,* which commonly causes brucellosis in goats, has been found to infect swine. From this it can be seen that swine should not be kept in con-

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Spencer, Indiana, October 1950

tact with Brucella-infected goats. Neither should cattle, horses, dogs, and other domesticated animals be kept in contact with infected swine

Brucellosis of swine is one of the important problems of the industry. Surveys indicate that 1 to 3% of all hogs are infected with this disease, which apparently is increasing.

The dangers to human health, particularly among farmers and butchers, should be given serious consideration. The owner or farm laborer taking care of infected swine may first get the germ on his hands. From there he may transfer it to his mouth or eyes and thus contract brucellosis. Aborted pig fetuses and the fetal membranes of infected sows contain millions of the Brucella bacteria. These should never be handled with bare hands.

Infected sows which farrow at the normal time may also be spreaders of the disease. Swine producers should be extremely careful in handling the membranes and new-born pigs of suspected sows. The germs usually enter the body through the mouth or eyes. However the germs find ready entry when the skin is broken by cuts or scratches. The germ may be present in the carcass of slaughtered swine. Therefore care should be exercised in farm butchering of hogs known to be infected with brucellosis.

The most common symptom of brucellosis in swine is abortion or the birth of stillborn or weak pigs. Abortion may occur so early in pregnancy that it may be overlooked. The hog breeder may think the sow didn't conceive. But abortions may occur at any time in the pregnancy period. Also, sterility in both the male and female are common symptoms of brucellosis of swine. Symptoms other than abortions vary considerably depending on the place in the body where the Brucella germs may reside. Lameness, abscesses, swelling of the testicles and inflammation of the backbone resulting in partial or complete paralysis, are the more common conditions that may be associated with Brucella infection in swine. These symptoms or diseased conditions are not present in a large percentage of the cases of this disease. They also may occur independently of any Brucella infection. In some instances, there are no outward signs of the disease.

Usually, the percentage of pregnant sows and gilts which abort is high in herds which have been recently exposed to the disease. In subsequent breeding seasons, the abortion rate shows a marked decrease and occurs mostly in the gilts, and in sows which are added to the herd. The decrease in abortion rate does not mean that brucellosis is no longer present.

Brucellosis is usually spread by breeding hogs from diseased herds. Susceptible sows and gilts contract the disease if served by a boar which gives off *B. suis* in the seminal fluid. The aborted young, after-birth, and discharges from the genital tract of the sow may contain large numbers of the germs. Probably the infection is contracted most frequently by susceptible hogs eating this material, or feed contaminated with it. This material may also be carried by dogs to nearby hog lots and pastures. Therefore, burning or burying is important.

Brucellosis is perpetuated in a herd, largely, by sows and gilts which have the disease but farrow normally. They are a source of infection at farrowing time and during the nursing period. The germs of the disease are then scattered about the houses and yards in the after-birth, discharges from the genital tract, urine and milk. The possibility of the infection being spread by pigs that are nursing a sow which has brucellosis should not be overlooked. Some of these pigs may become infected while nursing and continue to be a source of spread for several weeks or even months. *Br. suis* may also be carried to the premises on contaminated feed bags, by streams of water flowing through, or drainage from, infected premises, and by various other means of similar indirect exposure.

Brucellosis of swine cannot be satisfactorily diagnosed by means of symptoms or outward manifestations of the disease. Hence, the diagnosis is commonly based on the blood test. This blood test is similar to that used for the diagnosis of the corresponding disease in cattle. In swine brucellosis, however, the standard blood agglutination test is not quite as accurate as in cattle. In many cases *Br. suis* may be recovered from swine which are showing a negative or nearly negative blood reaction. The test has a practical use, however, in determining herd infection. Where brucellosis is suspected in a swine herd, the blood test should be made on all breeding animals. If positive reactions are found in dilutions of 1: 100 of the blood or over in any of the animals, the herd should be considered infected. All animals, regardless of their blood reaction, should then be considered as possible carriers of the infection.

A herd of swine may be considered free from infection when, on two tests made 30 to 60 days apart, no animal shows a titer of 1: 100 or over; there is no previous evidence of infection such as abortion, weak litters, or sterility; and no additions to the herd have been made within three months.

The most important preventive measure is to prevent the introduction of infected swine into a brucellosis-free herd. This is best

accomplished by purchasing replacements or additions from herds which tests show to be completely free of brucellosis. If this is not possible, each addition should be tested. No animal showing an agglutination reaction in any degree should be accepted. Replacements from herds of unknown disease history should be kept in isolation for at least three months and retested before entry into clean herds.

The use of community boars is a dangerous practice. Numerous incidents of the spread of the disease from an infected boar to healthy sows, and from diseased sows to a normal boar have been reported. Show swine may spread or contract brucellosis while at fairs and shows. Such swine should be kept in isolation upon their return before entering the main herd.

Since there is no cure and neither test and immediate slaughter of the reacting swine nor vaccination of swine has been satisfactory, the following two plans of control are presented:

Plan 1. Sale of the entire herd for slaughter. This plan is useful in herds, large or small, where the primary consideration is the production of pork. It is quick, easy, and economical. An interval of three to six months may be necessary to dispose of the entire herd, feeder pigs and all, and to clean and disinfect the premises and equipment. Replacement of the infected herd should be from herds free of brucellosis. Periodic blood tests should be conducted on the newly purchased herd as a means of detecting infection that might be resident about the premises. Brucellosis is primarily an animal-to-animal contact disease. Hence, early detection of animals that may become infected from the premises is essential to protect the replacement herd.

Plan 2. Test, segregation and delayed slaughter of infected herd. The details of this plan are: (1) Blood test the entire breeding herd. (2) If infection is present, consider the entire herd as infected rather than remove the positively reacting animals. Manage the herd as a unit. (3) Raise pigs from this infected unit. Wean and test the pigs at *eight weeks of age*. Isolate the negative pigs on clean premises as far removed as possible from the infected parent stock. Maintain this isolation until the infected herd is disposed of. (4) Blood test the pigs at intervals of 60 days up to and during the first pregnancy. Remove all reacting pigs as they occur. Breed only those gilts which are negative to the blood test to clean boars. (5) Dispose of the original infected herd as soon as suitable negative replacements are available, or as soon as it is obvious that the plan is giving satisfactory results. (6) Clean and disinfect thoroughly

the premises where the infected herd was kept—preferably under supervision of a competent veterinarian—prior to admission of the clean replacement herd.

This last plan provides for the raising of negative pigs from the infected parent breeding stock so that clean replacements of known bloodlines are available. Ultimate disposal for slaughter of the original infected herd is necessary, but is delayed until the quality, quantity and the disease status of the pigs is known.

Winter Feeding for Egg Production

Condensed from Rural New-Yorker

C. S. Platt
Rutgers University

SUCCESSFUL egg production during the winter can be secured only when the diet supplied is well balanced and the quantity of feed consumed by the birds is maintained at a high level. Both phases of the feeding program are essential and one can hardly be considered more important than the other.

Basically we have arrived at a point in poultry management where we depend upon just two types of feed, mash and grain. In times past we included green feed and often such extras as sprouted or germinated oats, but these have passed out of the picture despite their recognized feeding values. Everything considered necessary is incorporated in the mash now, and that mixture is the key to the whole feeding schedule. The grain is a supplement to the mash, fed chiefly as a source of energy, and its value for certain proteins. We could do away with the grain as such by grinding it up and adding it to the mash. In fact, such all-mash rations have proven very satisfactory and may yet have a place in the feeding program with the advent of automatic feeders. For the present, however, the feeding of both mash and grain will be standard practice on most farms.

A good mash for layers should contain from 20 to 22 percent protein. This may be made up

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from such ingredients as meat scrap, fish meal, soybean oil meal, or gluten meal. In addition, the corn meal, ground oats and wheat products in a mash all contribute some protein, in fact, about half of all there is in the mixture. However, the more concentrated sources must be added, not only to build up a mix that will analyze the needed percentage of protein, but also to furnish a better balance of amino acids which are necessary for the most economical use of proteins. For many years there was a tendency to belittle the value of soybean protein for use in poultry rations, the feeling being that a good mash mixture had to contain a large proportion of meat or fish products. Our present knowledge of the subject indicates that one of the chief values derived from the animal protein products was the so-called "animal protein factor" (APF), and, when it is supplied from other sources, the actual amount of meat or fish needed may be greatly reduced. This has placed more emphasis on soybean oil meal as a source of protein, and it has been found to be of greater value than generally realized.

In addition to its protein content, a good mash must contain some source of vitamin D, as well as vitamin A and the various factors of the vitamin B complex.

Above all, a mash should be free of dust or dirt and not too bulky in composition, as chickens do not like a mixture containing an over-abundance of oat hulls, wheat bran, alfalfa meal or products of similar nature.

After one is convinced that the mash is well balanced, the next problem is whether or not the birds can be counted on to eat enough of it to keep their productive machinery in smooth running order throughout the winter. One hundred pullets, regardless of the breed, will need to eat from 12 to 15 pounds of mash every day if production in excess of 60 percent is to be maintained. When a new flock is just coming into lay, the mash they consume may not be quite at the level suggested, as the general plan of feeding developing pullets usually is aimed at restricting mash somewhat, in order to delay maturity. At the age of five months, many pullet flocks will be eating only about six pounds of mash a day for every 100 birds, which is entirely satisfactory and even desirable. However, a month later these same pullets may be in the peak of production and, when that situation prevails, the mash consumption must be increased proportionately.

In our New Jersey egg laying tests the mash consumed has been at the rate of about two pounds a day for each dozen eggs laid. This makes an easy guide to follow without bothering with a lot of

calculations or even knowing how many birds are in the flock. All one need do is multiply by two the number of dozens of eggs collected for the day in order to determine how much mash should be consumed daily. If we apply the same method on the basis of a case of eggs, we find that for every case of eggs sold during the week the flock should have consumed not less than 60 pounds of mash during that time. Like all rules, this is subject to change, but the figure indicated is in line with actual practice on many farms. Modifications of it occur only where the type of mash used varies from the general run, such as in free-choice feeding or where a mash concentrate is supplied.

Suppose mash consumption is not up to par? Then cut back on grain, feed a moist mash, sprinkle water on the mash lightly, or feed a mash pellet. If mash consumption falls because of illness in the flock, naturally these suggestions for increasing mash consumption will not produce miracles. Yet even layers out of condition in the late fall and winter will often respond if measures are taken to keep the mash intake up to the level of not less than 12 pounds a day for each 100 birds.

Grain feeding is as important as the mash, and requires more judgment on the part of the caretaker. Chickens prefer grain to mash and will wait for the grain after they get accustomed to a certain feeding schedule. Once a day the flock should have all the grain it can eat. During the fall and winter this feeding should be given in the late afternoon. Our practice is to feed the grain in hoppers attached to the side walls. These hoppers are filled with grain at some convenient time during the day and then the lids are opened when the eggs are collected. A later trip to shut up the house for the night provides an opportunity to close the lids so that the birds have only mash to eat when they leave the perches in the morning.

A good general guide for such feeding is 12 pounds of grain for each 100 birds for Leghorns; 15 pounds for heavy breeds. When morning temperatures are down around freezing, some additional grain should be fed about eight a.m., approximately three pounds to 100 birds, regardless of breed. When zero temperatures are prevalent, the morning grain should be still more—about six pounds to a hundred birds.

Corn and wheat in equal quantities would be a good mixture for afternoon feeding, straight oats for the morning feed; or a mixture of 400 pounds of corn, 400 pounds wheat and 200 pounds oats may be used for both feedings. In fact, almost any combination will give good results; some barley or buckwheat also may be

included. If corn is cheap, the amount may be increased. Be a little careful of too much oats, however, as it may fill up the birds without providing the needed energy.

If a mash designed for this purpose is used, very good results can be obtained during the fall and winter from free-choice feeding; that is, providing separate hoppers for the mash and grain and allowing the birds to eat as they please. The self-fed birds may prefer grain to mash; therefore, in order to supply them with enough protein, minerals and vitamins a 26 to 30 percent protein mash, fortified with essential minerals and vitamins, is desirable to use. On the other hand, the system breaks down if any disease appears and production slumps. On such occasions, go back to standard feeding until the flock is in production.

Stumbling Blocks To Better Farming

Condensed from Iowa Farm Science

Carroll V. Hess and Earl O. Heady

In many instances farmers are aware of the profitability of a particular practice but do not adopt the practice—either for important economic reasons or other individual reasons.

This month, we want to look at some of the resistances to adopting more efficient livestock practices. Why such extreme variation between farmers in adopting recommended practices? Aren't farmers aware of these practices? Do they lack "know how?" Or, are there other more important reasons?

We asked the 120 southern Iowa farmers some questions about livestock practices and adjustment.

One question was about hog-production feed requirements. As a hog is fattened to heavier and heavier weights, increasing amounts of feed are needed to produce each additional pound gain. It's important that the farmer recognize this in finding the most profitable marketing weight.

We found 27 percent of the farmers in our study didn't know the true relationships. Of these, 14 percent believed that less and

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less feed was needed per pound gain as hogs were taken to heavier weights. And 13 percent thought feed requirements were the same regardless of weight.

We also asked about relative returns to feed from different livestock enterprises. Records have shown that labor, building and equipment costs make up a greater proportion of total expenses in dairying than in hog or beef enterprises. Therefore, returns per $100 feed fed to milk cows have to be larger to cover these additional costs.

Yet when asked to compare relative feed returns over a long period, 38 percent of the farmers questioned believed dairy returns per $100 feed fed were less than, or just equal to, those for hogs. Nearly 30 percent thought feeder-cattle returns greater than, or at least equal to, dairy cows. Comparisons were asked based on price relationships at the time of the study (1947).

Our conclusion was that a large number evidently don't have adequate knowledge of the particular kind of livestock which gives the greatest return from feed, labor or livestock investment under a given set of conditions.

To market hogs at the most profitable time, it's important to know the seasonal "high" and "low" price months for pork. Only 45 percent of the farmers we interviewed were able to name the exact month in which the market price for spring pigs is normally highest. The score was lower for fall pigs—only 20 percent named the correct month.

Returns are usually highest when hogs are marketed when prices reach their seasonal peak. But half the farmers in our study marketed hogs during months different from the ones they indicated as the high-price month. When asked why, most answered that, considering their capital position, risk involved, feed available and tenure situation, they were doing the best thing. And that may have been true.

Apparently knowledge of the high-price month still wasn't enough to induce earlier farrowing which would permit earlier marketing—or else other limiting factors outweighed this advantage. One-fourth of those interviewed said they "sold the hogs when ready," paying little, if any, attention to price situation.

Many who didn't farrow early said the cost of additional equipment and housing (and the higher death loss they expected) didn't justify early farrowing—despite higher prices from marketing earlier. Also, later farrowing permitted more use of pasture.

One-third of the farmers not planning to market hogs at the expected seasonal high, gave lack of capital as the reason. Farrowing earlier would require more

adequate housing and equipment. Actually, the real limiting factor was risk and uncertainty of future. Funds weren't limited in the sense they couldn't be borrowed. But the operators preferred not to jeopardize their financial position in an uncertain future.

Risk was important in preventing farmers from expanding their livestock enterprise. Some attempted to meet the risk problem by producing only enough livestock to use home-produced feed.

About 36 percent of the farmers built the size of their livestock enterprise from year to year around home-grown feed supplies. There was a deep-seated feeling that buying feed for livestock production involves more risk than feeding only home-grown grain and forage.

Forty-three percent gave limited equipment, labor or feed as the reason for not expanding their hog enterprise. With current high prices for these items, they felt the risk of loss from borrowing didn't justify using additional funds in buying added equipment and feed or hiring more labor.

Some tenants felt they were hampered in adjustments by leasing terms. The remaining few were satisfied with things the way they were.

The few farmers who followed both spring and fall farrowing did so because they thought it resulted in more efficient use of available equipment and housing. Very few seemed to appreciate the steady distribution of income derived from the two-litter system and the decreased risk from marketing hogs at different times during the year.

Some groups have considered dairying a possible answer to the livestock problem in southern Iowa. So we asked the farmers in our study what changes they would make in their livestock organization in response to a 20 percent increase in forage. Contrary to our expectations, only 15 percent would increase their dairy herd.

Most would have increased other roughage-consuming livestock. Forty percent preferred to increase beef cows, with 20 percent increasing sheep. Lack of labor to handle additional milk cows was the important reason. The remaining 25 percent "weren't equipped for dairying" or "could increase other forms of livestock with little or no cost."

The human factor enters the picture, too. Of the farmers who preferred not to expand their dairy, 16 percent expressed the personal attitude "don't like to milk cows."

Limited capital is a factor that prevents adoption of high-producing animals where they would otherwise be profitable. Young farmers and others with limited capital say, for example, that in-

stead of spending $300 on a high-producing milk cow, they'd buy a less productive cow for $200 and spend the remainder on two brood sows. They do this to spread the risks and to make the greatest return with short funds.

Renting is a problem with other livestock practices. While an operator may not be using the most efficient sanitation methods, the practices may still be the most profitable alternative considering the buildings and facilities available and the possibility of moving.

Lack of knowledge seems to be an important consideration in simple livestock feeding practices which could be put into effect even on rented farms. In some cases this can be done at a lower capital cost than the method being used.

Another common observation we found is this: Maximum profits aren't the only goals in farming. Many farmers are willing to accept a lower but more certain income. So "stability" or "certainty of income" is an important goal in farming.

Often, two farmers side by side frequently followed altogether different livestock systems and cropping practices. Many times, both of them were right considering their capital situation and ability to withstand risks.

The operator with plenty of capital was able to take on the high risks associated with cattle-feeding—and this paid high returns in 1947, the year of our study. Yet his neighbor, a beginning farmer, was equally right by investing in chickens and hogs which weren't so likely to undermine his limited capital position if prices broke.

Thus, a farmer may still be an "efficient" operator even if he sacrifices some income by not adopting some approved practice to get a more certain income from some other system of farming.

Durisol From Wood Shavings

Condensed from Chemurgic Digest

CHEMICALLY - MINERALIZED wood shavings are being combined with cement to make a strong building material which has many of the best qualities of both wood and cement. The name of this material is Durisol.

Durisol is a light weight, precast concrete material. The finished product is incombustible, insulating and sound-absorbing and is not subject to attack by mold, fungus, rats or termites.

Durisol, a word derived from two French words meaning *durable* and *insulation,* was a development of chemurgy in reverse. It was not compounded as a result of seeking some way to use wood shavings. The basic product was developed because several Swiss engineers realized the need for a product having certain qualifications, and then began looking for the raw materials with which they could attain the desired end-product.

When the engineers began their work they established the characteristics of the product desired. They wanted something which would be based on raw materials which were available everywhere. They wanted something with machineability and some of the other basic qualities of wood; yet which had the durability and stability of concrete. They wished to avoid the weaknesses of both articles.

Durisol meets these requirements. It is pre-cast, so can be made in many shapes and forms but the slab is the most common. It weighs 35 pounds per cubic foot. It can be handled with ordinary carpenter tools, yet it is rough enough to take directly such covering coats as cement, stucco and plaster.

Paint sticks easily to Durisol, but it lessens Durisol's ability to absorb sound. If a smooth surface is desired for a ceiling, gypsum plaster can be applied directly to the Durisol without lath.

Durisol's Beacon Plant produces 250 cubic yards of finished Durisol a day, and serves the New York and part of the New England area. This production requires approximately 300 carloads of byproduct wood shavings a year, nearly 5,000 tons of dry shavings. Sawdust cannot be used because the fibers are too short. Current practice is to use softwood shavings from northern New England and New York, at a delivered price of $16 per ton.

Reprinted by permission from Chemurgic Digest,
National Farm Chemurgic Council, Inc., New York, N. Y., September 1950

Hired Men Take An Interest

Condensed from Farm Journal

William Gilman

How can you get your hired help to take the same interest in your business that you do?

"You can't," you say. But wait —you may be able to go a long way toward it.

Arthur M. Goodnow, a Vermont farmer, wrestled with this problem back in 1947. It was Thanksgiving time, and Goodnow's turkeys were ready for market. Then deer season came along, and the hired man liked hunting about the best of anything in this world. You know the rest: not all of the turkeys got dressed.

Right then Goodnow, who is Vermont's biggest turkey grower, decided to do something about giving his help a sense of responsibility.

What he came up with is a profit-sharing plan that might work for you, too. It gives an added *incentive.*

The scheme is simple: pay regular wages to key employes. At the end of the year, cut them in on a share of the operating profits.

It's worked for Goodnow ever since he started it on January 1, 1948. Four employes are covered by the plan. Let's see how it works:

First, they get the going wage for married farm help in Vermont: $100 a month in cash, plus free rent, vegetables, milk, firewood, telephone, and gasoline for driving to and from work.

Then each of them, at the end of the year, gets one-twelfth of the profits. Last year that bonus came to about the same figure as their wages. In 1948, which was a bonanza turkey year, the bonus was more than three times the cash wages.

And how does it work out for Goodnow? He says he's farming not only bigger, but easier. He looks on the plan as a labor-saving and worry-saving device. It's put him and the hired men all on the same team.

How about details? Who pays for what?

First of all, Goodnow pays himself the same wage he pays his men.

Then he deducts all operating expenses: taxes, insurance, equipment depreciation, building maintenance and repairs; costs of feed, sprays, gasoline, and small tools;

Reprinted by permission from Farm Journal,
Philadelphia, Pennsylvania, July 1950

and 5% interest on money Goodnow advances for buying supplies. That's the same rate the local banks charge. He charges depreciation at the rate he enters on his income tax return.

Then each hired man gets one-twelfth of the profits remaining. Goodnow settled on that figure because he expected he'd have six men sharing the profits, and he'd earmarked half of the profits for them. It turned out, however, that only four of his crew qualified.

For himself, Goodnow gets half to two-thirds of the profits (depending on how many men are in on the plan) for his management, and as interest on his investment, and for risking his money.

How did it work out on the farm? Irwin Bugbee ran the orchards; Dick Burbank and Homer Welch ran the turkeys; Jack Barnes had charge of field work.

Each man is interested in the other's job. For example, Burbank and Welch's turkeys graze on Barnes' meadow, and Bugbee gets turkey feathers to mulch his trees.

Goodnow is still the boss, and he made it clear at the beginning that he has the right to hire and fire.

Profit-sharing means that the crew thinks in terms of how to make money. Take the way they use the 220-foot brooder house. Two springs ago they started 12,000 poults in it. In the fall they transformed it into an assembly-line dressing plant. As soon as the turkeys were dressed, the house got a scrubbing, and in went 7,600 chicks that came off as broilers before the next crop of poults went in.

Irwin Bugbee sums it up: "This plan works fine. If I ever leave here, I hope I can find another hook-up like it—a chance to turn your own ideas to profit."

Sewage Is No Problem

Condensed from The Farmer

Robert G. Rupp and Barbara Bailey

OFTEN the gravity type farm sewage disposal system cannot handle all the waste in hardpan areas of heavy, impervious subsoil.

Now, thanks to a new surface-bed sewage system, this difficulty has been overcome.

More than 50 farm families in the flat, fairly heavy soil area of

Reprinted by permission from The Farmer, St. Paul, Minnesota, August 19, 1950

Polk County, Minn., have had tile line disposal systems for five years without a single failure.

In Ramsey County, N. D., well over 100 families have added bathrooms to their homes by taking advantage of a "packaged" sewage system, where the entire purchase and installation outside the house was handled under one agreement.

The story is the same all across the country. Manufacturers, suppliers and agricultural engineers are keeping up with their demands by designing facilities and sewage disposal systems that will work in almost any soil, regardless of how high the water table may be.

The surface-bed disposal system is catching on all across North Dakota. In Ward County, for example, 75% of the systems being put in this year are of that type.

Called the "Nodak," it was designed by J. Clayton Russell, North Dakota Agricultural College extension engineer, with the help of Richard Witz, experiment station engineer.

The Nodak, which has the approval of the North Dakota State Health Department, deposits waste water in the porous layer of soil which covers heavy clay subsoil areas common to the Red River Valley. It will work out well in other flat, high water table areas where the soil type is similar.

Inexpensive and easy to install, much of the work can be done with farm labor. One farmer took 50 hours, with the help of Russell, to put in his. The total cash outlay was $198. Russell estimates ordinary gravity systems which don't drain properly can be converted for $100 to $125.

The system, which is explained fully in North Dakota Agricultural College Extension Circular AE 33, works this way:

Waste from the house drains into a 1,000-gallon concrete septic tank located outside the basement, where the raw material is broken down by bacterial action, just as happens with any septic tank. Then, instead of going directly to an absorption bed, the clear liquid goes into a holding chamber.

From the holding chamber, the liquid is pumped to a ground-level distribution chamber, where it is spread evenly over a surface gravel bed.

This disposal bed, usually circular and about 20 feet across, has a ring of clean pea-size gravel one foot deep around the distribution box. Clean, bank-run gravel covers the balance of the bed.

Straw covers the entire bed to insulate it against freezing. A planting of shrubs hides it from sight.

In Minnesota, Dennis Ryan, Extension Engineer, designed a system (explained in University of Minnesota Extension Service Bul-

letin 247) with a different disposal field.

Instead of the holding chamber and surface disposal box, in his system the clear liquid flows directly from the septic tank into tile lines laid in the porous soil layer. A foot of gravel, laid below the field tile, speeds up drainage.

When the 50-tile-line systems were laid in Polk County five years ago, Carl Ash, county agent, who supervised the jobs, listed three specifications which were to be followed during installation: (1) the septic tank must be at least 800 gallons in size; (2) tile could not be laid more than two feet below the surface of the ground; and (3) there must be 50 feet of tile for each person using bathroom facilities.

There are other systems for other trouble areas—enough different ones so that no family need hesitate about putting in running water and a bathroom.

Feeding Soft Corn

Condensed from The Dakota Farmer

Marjorie G. King

Experiment Station Editor

Material provided by Dr. D. B. Shank, Prof. H. H. DeLong, and Prof. Turner Wright, of South Dakota State College

Among the many questions asked the experiment station about feeding soft corn are these: "To what class of livestock can I feed my soft corn?" and "What is its value as compared with a good grade of hard corn?" The South Dakota State College experiment station started a series of experiments in 1943 to try to answer these questions. The different classes of livestock used each year were:

Cattle—two lots of yearling steers, grading medium to choice, and two lots of steer calves, grading good to choice, 10 head in each lot.

Hogs—four lots of good to choice feeder pigs, 20 head in each lot.

Lambs—two lots of good to choice feeder lambs, 20 head in each lot. These animals were divided into uniform lots at the beginning of each trial on the basis of weight, type, quality, and condition.

Yellow corn and alfalfa hay, grown locally, were used in these feeding trials. The alfalfa hay graded U. S. No. 1, extra leafy,

Reprinted by permission from The Dakota Farmer, Aberdeen, South Dakota, November 4, 1950

and the hard corn graded No. 3. The soft corn was harvested with mechanical pickers and contained a considerable amount of husks. At the time of purchase, the shelled corn taken from soft ears had an average of 25 to 32% moisture. All moldy and spoiled ears remained in the corn during storage.

The hard corn was cribbed. The soft ear corn was stored in long, uncovered piles on the ground. It was fed field run, including all moldy, rotten, soft, or husk-covered ears. During the winter months, there was some snow and ice in the soft corn when it was fed.

Chemical analyses showed that there was less protein and fat in the soft corn at the start of the feeding trials than in the hard corn, and these differences increased as the corn continued to mold and rot with the advance of the feeding period. There was also a marked reduction in both moisture content and test weight per bushel of soft corn with the coming of warm weather in the spring. No difficulty was experienced in getting any of the stock on a full feed of the soft corn.

Cattle were started on feed in December of both years. Broken ear corn was full fed, and alfalfa hay was offered in amounts that would be eaten readily after the corn had been consumed. There was a tendency for the cattle on soft corn to make faster gains during the first part of the feeding period.

In 1943, the cattle fed soft corn excelled those fed hard corn in rate of gain and finish throughout the experiment. In 1945, however, the cattle fed hard corn excelled those fed soft by market time. In this trial the soft-corn cattle were definitely more growthy and unfinished than the hard-corn cattle. On the basis of the two years work, the carcasses from both groups were very similar in grade.

In the two feeding trials, 100 pounds of hard ear corn plus one pound of alfalfa hay, when fed to the yearlings, was equal to 138 pounds of soft corn, based on December purchase weights. Similarly, 100 pounds of hard ear corn, plus one pound of alfalfa hay, was equal to 175 pounds of soft corn when fed to calves. During the winter feeding period, however, 100 pounds of hard ear corn was equivalent to 121 pounds and 130 pounds of soft ear corn for fattening yearlings and calves, respectively.

Pigs fed hard corn made slightly faster gains than those fed soft corn, and required less corn for 100 pounds of gain. The requirements for protein supplement, alfalfa, and mineral were practically the same. When compared on a dry matter basis, however, there was very little differ-

ence in the amount of feed required for 100 pounds gain (because of the lower price of the corn), and likewise, a greater return per pig.

When marketed, the hogs fed hard ear corn shrank 1.5% more than those fed soft ear corn, but dressed approximately 1% higher. The carcasses in all four lots graded good to choice. In these two feeding trials, 100 pounds of hard ear corn was worth 130 pounds of soft ear corn, plus one-half pound of protein supplement. The pigs were ready for market before the coming of warm weather.

In similar trials with pigs fed during the spring and summer months, relatively greater amounts of both corn and protein supplements were required by the pigs fed soft corn than by those fed hard corn, to produce 100 pounds of gain.

The total amounts of dry matter required to produce 100 pounds of gain were greater for the pigs fed soft corn than for those fed hard corn. There was practically no difference in the shrink from feed lot to market for any of the lots. The slaughter data showed approximately 1½% higher dressing yield for the hogs fed hard corn. All of the carcasses graded good. In this feeding trial, 100 pounds of hard ear corn was worth 142 pounds of soft ear corn plus 11.5 pounds of protein supplement. These results indicate that if soft corn is to be used in fattening pigs, best results will be obtained by feeding it in the winter unless it can be stored without increased spoilage.

It usually is considered that lambs are more likely to have digestive disorders from eating moldy feeds than other classes of livestock, so there was some anticipation of loss when these first lambs were put on soft corn. The lambs for each of these first two soft corn feeding trials were placed on feed early in winter (December and January) and fed for an average 88-day period. The rations consisted of ear corn and alfalfa hay supplemented with minerals.

No difficulty was experienced in getting the lambs on full feed. All lambs remained healthy and vigorous throughout the fattening period, with the exception of those that died as a result of overeating (two fed soft corn and five fed hard corn).

The gains made by both lots were similar and very satisfactory. The lots were also similar in selling price per hundredweight, shrink to market, and carcass grade. In these trials, 100 pounds of hard corn was equal to 123 pounds of soft corn plus nine pounds of alfalfa hay. Because of the lower price paid for the soft corn, the lambs on this ration returned more money per head than those fed hard corn. These trials

were completed during the winter months before the soft corn had reached its worst stage of mold and decay.

An observation test was made to find out the effects of feeding such corn to sheep during warm weather. On May 29, 10 head of yearling sheep were shifted directly from a feed of corn, oats, and alfalfa hay to one of soft, moldy corn and alfalfa hay. The feeding continued for six weeks. The sheep ate the soft corn readily and no digestive troubles were experienced during the entire period. At this station, the sheep have consumed the soft, moldy corn as readily as other farm animals and without any ill effects.

Results of Trials

1. A farmer who has soft corn usually will obtain a greater return from it by feeding it to cattle, lambs or pigs, than by selling it as cash grain.

2. The soft corn in these trials was utilized best by yearling cattle, followed by lambs, pigs, and steer calves.

3. Soft ear corn should be fed during the winter months. When the soft corn was left in outdoor piles during the entire cattle-feeding period, it deteriorated during the warmer seasons. Its value for the entire period of feeding yearling steers was only 73% that of hard corn, as compared with a value of 82% when fed during the winter. Likewise, when fed to calves, its value dropped from 76 to 57% of that of hard corn.

4. Studies made on soft corn piled on the ground indicated that it can be so stored only during winter months. If the amount of soft corn is greater than that which can be fed before the beginning of warm weather, it should be stored in narrow cribs to allow it to dry out rapidly with the coming of spring.

5. Soft corn can be fed without any special preparation such as drying, salting, shelling, crushing, or grinding. When broken ear corn is fed to cattle and sheep, wastage is reduced. Shelled soft corn and ground soft ear corn were eaten readily but were difficult to store; they heated and further molds developed.

6. Soft, moldy corn was palatable to cattle and sheep. When both were offered in separate bunks, the soft corn was the first to be consumed.

7. No bad effects occurred in shifting livestock from a full feed of good quality grain to a full feed of soft, moldy ear corn.

Chick Sexing

Condensed from Everybodys Poultry Magazine

Lewis Mortensen

Most poultrymen can remember the day when they ordered their first lot of sexed chicks. It hasn't been so many years ago. And yet, today a large proportion of all commercially produced chicks are sexed. This is a practice that has developed so rapidly that it is practically taken for granted today by most chick buyers. During recent years turkey hatcherymen have also offered sexed poults for sale because separation of the sexes offers so many advantages.

The origin of baby chick sexing is usually credited to China where it was done haphazardly and inaccurately by some poultrymen on their own chicks. The Japanese took the art to Japan where it was developed and improved to some extent. However, it still was not done commercially until the advent of electric lighting. Some early Japanese sexors used the bright rays of the sun as a light, which was satisfactory but far from ideal because of the glare. The accuracy was seldom above 90 percent, and the technique was not at all standardized.

After electric lights came into fairly common use, chick sexing became commercially feasible and eventually was brought to western Canada. Some poultrymen in northwestern Washington took their chicks into Canada to have them sexed, since the Japanese could not get visas to enter the United States. Finally, in the fall of 1933 and the spring of 1934 a sexing school was conducted by the Japanese under the sponsorship of the Washington State Poultry Cooperative, in which a number of American boys and girls were trained.

Many breeders and hatcherymen remember the practical demonstration of the speed and accuracy of this method of sexing, given by Japan's champion chick sexor in August, 1934, at the I. B. C. A. convention in Grand Rapids, Mich.

Some of the trainees of the first sexing school traveled East and by 1937 a number of large eastern hatcheries had some chick sexing done. These first students were not flexible in adapting themselves to different breeds and different sexing conditions. They had been taught a specific technique which was satisfactory for a certain breed but was not ap-

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plicable to some other chicks. This situation continued with few exceptions up to the 1940's.

During the last ten years there has been considerable progress made in developing improved techniques which are not only more accurate but are more flexible in meeting various conditions. It is now possible to sex baby chicks of all breeds hatched in any incubator at ages ranging from four hours up to feeding time with accuracies of over 99 percent and without any harm. The technique also has been much improved in so far as neatness and general efficiency are concerned.

However, there are literally hundreds of different sexing conditions which a commercial chick sexor must recognize and to which he must adapt himself in doing commercial work at different hatcheries. It is wrong to assume that all chicks can be sexed with equal ease. Each breed, each incubator, and each age are all factors which, alone or in combination with each other, present different problems for the sexor.

The number of people who make really good chick sexors are relatively few. A good chick sexor must be a mechanically skillful person with adaptive ability.

Chick sexing has become a vital part of modern poultry production. Many hatcheries producing White Leghorns find that as much as 90 percent of their orders for baby chicks are for sexed pullets, since this practice has made it possible for the flock owner to purchase all pullet chicks instead of having to provide housing, equipment, feed and labor for cockerel chicks until they can be identified and removed from the flock or held until they reach a marketable age. Hatcheries producing meat type chicks also are finding that more and more customers are demanding sex separation so that the chicks may be raised separately. There is apparently some increase in feed efficiency, besides making for much more flexiblity in marketing. The same situation holds true in turkey production.

Sexing has also made it possible for hatcheries to purchase sexed pedigreed day-old cockerels from breeders, placing these chicks in the hands of their regular flock owners to raise with their pullet chicks for the year ahead. This eliminates the hazard of introducing disease with mature or partly grown cockerels.

All phases of poultry production are becoming more and more specialized and chick sexing will become an indispensable tool in implementing such specialization.

Molybdenum Aid To Alfalfa

Condensed from New Jersey Agriculture

MAINTAINING a productive stand of alfalfa has become increasingly difficult in New Jersey in recent years. The failure of the crop is often easy to explain—disease, insects, lack of lime or deficiencies of potassium, nitrogen, boron or manganese.

In other cases, however, the failure of the crop cannot be laid at the door of any of these causes, indicating that something else is responsible for reducing the yields and the life of the stand.

Scientists in Germany and Australia have reported good effects from applying molybdenum salts to fields of alfalfa and other legumes. Accordingly, the Soils Department of the Agricultural Experiment Station of Rutgers University launched an investigation to determine whether similar applications would work in New Jersey.

Samples of 18 important New Jersey soils were tested and a great variation in the molybdenum content was discovered, ranging from 0.8 parts per million to four times that much or 3.3 parts per million.

An analysis of 24 alfalfa samples from New Jersey farms revealed an even greater variation in molybdenum content, ranging from less than 0.1 parts per million to 14 times that much.

Alfalfa fields on six Sussex County farms were treated with sodium molybdate at the rate of 1 pound per acre. The chemical was mixed with sand to facilitate even distribution. Appreciable increases in yields were obtained on 5 of the 6 farms. The highest increase was more than 27 percent and the average for all locations was a little more than 13 percent. It was also found that the molybdenum treatments caused increases in the nitrogen content of the alfalfa on 4 of the 6 farms and increased the molybdenum content of the alfalfa in all tests.

These tests indicate that farmers whose soils are low in molybdenum can increase alfalfa yields by applying small amounts of this element. The effect of these treatments on the longevity of alfalfa stands has not yet been measured by the New Jersey Station.

Reprinted by permission from New Jersey Agriculture,
New Brunswick, New Jersey, September–October 1950

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New Brunswick, New Jersey, September–October 1950

Life Span of Average Tractor

Condensed from Agricultural Situation

A. P. Brodell and A. R. Kendall
Bureau of Agricultural Economics

THE average life of the farm tractor has increased about 50 percent during the last decade. According to information received from crop correspondents of the Bureau of Agricultural Economics, an average use of 19 to 20 years was indicated for factory-made wheel tractors on farms January 1, 1948.

About 96 percent of the wheel tractors bought in 1938 were still on farms on January 1, 1948. Forty-four percent of the 1928 tractors and only about 4 percent of the 1920 tractors were estimated to be on farms at that time. Factory-made wheel tractors accounted for about 90 percent of all tractors on farms January 1, 1948.

Two factors were most important in the increase in tractor life in recent years. During the war, many farmers who were faced with high wage rates and high feed prices switched from animal to tractor power. The supply of new tractors was insufficient to meet the tremendous demand and many farmers had to buy reconditioned used tractors. Many used tractors in dealers' hands January 1, 1942, that were to be junked, were reconditioned and sold to farmers.

The second factor is that tractors have become obsolete more slowly. Although there have been many changes and improvements in tractor design and performance during the past 2 decades, they were substantially less than in the decade which ended in 1930.

Life of farm tractors has increased despite a marked increase in annual use. In 1930 all farm tractors, of which the great bulk were wheel tractors, were used an average of 400 hours a year. Wheel tractors were used an average of 488 hours in 1940 and 634 hours in 1947.

Annual use of tractors varies widely with the tractor age. In 1947 wheel tractors 10 years of age and less were used 676 hours, the 11 to 20 year old tractors 570 hours and those over 20 years old an average of 270 hours.

Many of the old tractors are on small farms that have but one tractor. However, many operators of medium and large size farms have more than one tractor and use the old tractor only for extra

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power during the rush season or for specific jobs.

Where there is but little work to be done, old tractors often provide power at a relatively low cost. Under normal conditions the market value of a tractor at the end of about 10 years, is not greatly different from the trade-in value at a still later period. Thus, depreciation costs of old machines are small.

Although the life of the tractor has increased markedly during the past decade, it may increase somewhat further in the years ahead. Practically all of the wheel tractors now on farms are equipped with rubber tires and the great bulk of them were designed for row crop work. Tires reduce vibration which in turn reduces tractor wear and increases tractor life. Also, it is believed that during the past several decades life of the all-purpose tractor has been somewhat greater than that of other wheel tractors. Furthermore, since 1940, the percentage increase in tractor numbers on small farms has been greater than that for large farms. Annual use of machines on the small farms is less and average life greater than on the large farms.

Pasture Partners

Condensed from The Organic Farmer

William Gilman

WHEN Earle Fowler started with hens 33 years ago, there wasn't much poultry science to guide him. But he did have a dollar-and-sense practicality which led him to work *with* nature, not against her.

The result is a highly successful poultry farm near Manchester, Vt., where he and his son Robert use sheep in thoughtful grassland methods which reap from the soil without mining it. Theirs is the best pullet pasture this writer has seen in New England.

The Fowler range happens to be on a sidehill, where rainfall if uncontrolled could cause ruinous erosion. But here rain falls on a turf under which healthy soil drinks it in and holds it on tap for dry spells.

Thanks to the small flock of sheep rotated through the range

Reprinted by permission from The Organic Farmer, Emmaus, Pennsylvania. April 1950

to keep it mowed properly, and to genuine fertilizer which they and pullets supply, the range looks like a rug.

Short, succulent grassy shoots of that kind—rich in proteins, vitamins and minerals—mean money saved on the healthy 2,500 replacement birds raised yearly for the laying flock of 3,500. Inasmuch as good pasture is known to net a saving of four pounds grain per growing bird, Fowler figures on five tons saved annually.

As for the two dozen Suffolk ewes and their crop of around 30 dressed lambs, Fowler says the old rule still holds true—wool pays costs and lambs represent profit.

All this fits a time-table that he has evolved to make the pasture needs of growing pullets and lambs match the period of most abundant grass supply. The same time-table enables their egg and meat products to be sold for what a Vermonter calls "the top dollar."

The sheep are fairly recent. It was 19 years ago that Fowler started experiments aimed at having good poultry pasture with less work. Like others, he had been moving cumbersome range shelters. He stopped the rotation and saw his birds doing nicely on their permanent pasture. Where newly seeded pieces had frequently been chopped up or muddy, pullets now grazed on a firm sod.

Fowler knew that the birds got most nourishment from tender, young shoots of grass and clover. This was the pasture's condition in early spring. But it wouldn't be long before grass got away from the young birds and became tough. As an antidote, Vermont's extension poultryman, Donald C. Henderson, advised m o w i n g. Fowler began doing this with a mowing machine which his truck pulled over the range three times a season.

This provided a constant supply of succulent pasture. It also paid in reducing disease problems. Keeping the grass cut allowed purifying sunshine to penetrate to turf roots more easily. This discouraged snails and other hosts to parasites. Fowler saw that his pullets were suffering from less range paralysis and other common infections.

As his flock increased, he worked out a simple method for enlarging the range. He merely placed new shelters into hayland which had originally been seeded to timothy and red clover. Every other year, for the first few years, he balanced the poultry's nitrogenous manure with lime and phosphate, and nature did the rest. As timothy and red clover disappeared, native bluegrass and white clover moved in to replace them with nourishing permanent greensward.

The next e x p e r i m e n t was forced by the war when Fowler

wanted to reduce labor. In place of the mowing machine, he tried grazing cows on the range. But they left too many disease-breeding clumps of grass.

Fowler talked it over with County Agent J. A. McKee who suggested trying sheep. He pointed out that their fairly close grazing helps maintain a grass cover, and their trampling compacts the soil, thereby producing conditions for good turf.

When Fowler learned there was no disease common to chickens and sheep, he went ahead and discovered that the wooly animals were splendid lawn mowers. They had a fondness for poultry grain, but this problem was handled easily by having hoppers always on the other side of the fence.

There are three main ranges of two acres each, and two more of an acre apiece. Sheep rotate through them, eating grass along with the birds. Hip-high sheep fencing separates the ranges. Pullets can go through it, but the sheep cannot. Every two or three days, they are moved on to another range.

Still another innovation was successfully introduced last year by son Robert who has taken over the outside work on the farm. To reduce labor and encourage pullets to range farther from their shelters, he abandoned hoppers in favor of ground feeding. Scratch feed and pellets are spread from a truck which takes a different route each time. This keeps both truck and birds from tearing up any one spot, and an entire feeding operation can be done in 10 minutes.

The upshot of it all is that, although part of the range has been pastured continuously for 19 years, it still looks like a golf course.

Similar alertness shows all through the operations, and allows the two men to make a nice living from the small farm. They sell a half million eggs yearly—every one candled and graded. As a result, the Fowlers are paid premiums for not only table eggs but also for their main crop, which is production of Rhode Island Red-Barred Rock cross hatching eggs that are sold for broiler chick production.

The Fowler schedule aims at selling most of their produce when it brings highest prices. The same time-table saves the range from being over-grazed when grass growth slows down in mid-summer. Lambing time was moved ahead to February. Grazing begins in mid-April when grass starts in being lush. By July, lambs are of the size preferred by private freezer customers. Young birds are also doing most of their growing when grass is at its best. Hatching begins in late December, and birds join

sheep on the range in early spring.

Housing them for laying begins in June, and enables the Fowlers to hit peak prices with heavy egg production. In this, the 2,500 pullets are joined by 1,000 "swing shift" hens wintered over for a second summer's laying. In November, when egg prices drop and meat prices are high, the Fowlers do their heavy culling which leaves them with the 1,000 birds they over-winter, plus 200 saved for breeding replacements.

So part of the Fowler success is due to alert marketing. The rest is based on a realization that nature is ready with a helping hand for the poultryman smart enough to cooperate with her.

Meat From Grass In Britain

Condensed from Foreign Agriculture

A. B. Lees

THERE is a tradition in Britain that grass produced in an old, cherished pasture makes better livestock feed than grass grown in a temporary pasture. Postwar experiments by British agricultural scientists, however, indicate that properly managed rotation pastures can produce more grass and meat per acre than permanent pastures.

During World War I much old grassland in the United Kingdom was plowed and planted to crops, but when the war ended there was a general shift back to permanent pasture. Some of this land was neglected and declined in productivity. Since the last war there has been another significant shift from crops back to grass, accompanied this time, however, by a campaign to keep this land in rotation so that production will not be merely maintained but increased.

The work of Sir George Stapledon and others on the use of improved strains of grasses and clover, together with the use of grass in crop rotation, has attracted wide attention. It has shown that good rotation pastures, known in the United Kingdom as leys, often produce more grass than permanent pasture.

In recent meat production trials, conducted in eight different districts of Britain and spread over

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three grazing seasons, new leys have produced up to 476 pounds of meat an acre.[1] In all cases the livestock was on ordinary farms, but records were kept by research workers employed by Britain's Ministry of Agriculture at the Stratford-on-Avon Grassland Improvement Station. Seed mixtures for the leys were mostly of ryegrass and clover, with timothy or cocksfoot added where conditions warranted. Soil analyses were practically the same both for leys and permanent pasture.

In Leicestershire, famous for beef production off the grass, one of the leys on which experiments were conducted was a 26-acre field plowed up during the war to give two first-class crops of potatoes and one of wheat. The ley adjoined the permanent pasture against which it was tested after being drilled in spring with the following mixture:

	Pounds per acre
Italian ryegrass .....(NZ)..	8
Perennial ryegrass .....S24..	6
Do .....A101..	4
Do .....S23..	14
Red Clover .....S123..	2
White clover .....S100..	1
White Clover Kent	0.5
Total	35.5

The ley was sown direct, not under a cover or nurse crop. In the first season, the pasture carried one bullock and one sheep to the acre from June to October.

[1] This compares with 500–700 pounds of meat per acre produced from some United States irrigated pastures.

This was the only one of the centers where gains on leys did not exceed those on permanent pasture. The difference was 15 pounds live-weight increase an acre in the first year. In the third year, however, the old grass was only 3 pounds ahead of the ley. Even so, the quality of the meat from the ley was better—31 out of 43 cattle dressed out at more than 58 percent of live weight compared with 24 out of 39 from the permanent pasture.

At the second Leicestershire center, the ley out-yielded the permanent pasture by 18 percent. At the other seven centers in Sussex, Essex, Hereford, Bedford, Durham, and Norfolk, the ley produced greater live-weight increases than the old grass. At Bedford, the ratio was no less than 59 percent in favor of ley and in Sussex, 54 percent. The Sussex Trial was a particularly interesting one:

To meet soil requirements as shown by analysis, the permanent pasture was dressed with 2 tons of ground chalk per acre in 1944 and 100 pounds of triple superphosphate in March 1945. In 1943 the ley, which was first to be planted in corn, was given 300 pounds of compound manure per acre. After the seed had been sown, each acre of the ley also received 3.5 tons of chalk, 400 pounds of superphosphate, and 100 pounds of sulfate of ammonia. Both fields were also dressed with

500 pounds of basic slag to the acre in December 1945 and with 100 pounds of nitro chalk to the acre in March 1946, with no further manuring.

In each year, both pastures were stocked from spring to autumn with bullocks and heifers for fattening and grazed lightly with sheep during the winter periods. Each field was divided into two paddocks to allow a simple system of rotational grazing, and the bullocks were regularly weighed. as measured by the grazing days, was practically the same on both fields, the live-weight gain of the cattle on the ley was 1.78 pounds a day, and on the permanent pasture, 1.35 pounds a beast a day (ratio 132: 100). It must be noted that drought occurred in the third year.

The live-weight increase an acre was greater in each year on the ley, the latter exceeding the permanent pasture by 146 percent, 28 percent, and 32 percent in the 3 years

TABLE 1.—*Comparison of gains on permanent pasture and leys*

Item	Permanent pastures			Ley		
	First year	Second year	Third year	First year	Second year	Third year
Grazing days an acre	161	148	142	242	192	138
Live-weight increase in pounds an acre	194	264	184	476	337	242
Live-weight increase in pounds per grazing day	1.21	1.78	1.35	1.97	1.77	1.78
Average initial weight of cattle, hundredweight	7.8	8.1	9.0	8.5	8.5	9.0

As shown in the table, the ley maintained a higher output than the old grass over the season as a whole in each year, on the basis of live-weight gain an acre.

In the first and second years, more grazing days were obtained from the ley while the live-weight increase a day in the first year was 1.21 pounds on the permanent pasture and 1.97 pounds on the ley. In the second year, there was little difference in the live-weight gain of the cattle. In the third year, when the stocking intensity, of the trial. Seven out of 29 cattle from the old grass were top grade at market compared with 11 out of 36 from the ley.

Methods utilized at the Sussex center can be taken as an example of what British agricultural scientists would like to see adopted by farmers in various parts of their country. If British farmers generally adopt these methods of ley farming, they will go far in contributing to the success of the Government's 4-year program to increase Britain's farm-land output.

Two New Breeds of Hogs

Condensed from The Southern Planter

Harold B. Swanson

Two new swine breeds, developed by the University of Minnesota, have joined the elite circles of officially recognized swine breeds.

The breeds are known as Minnesota No. 1 and Minnesota No. 2 and are now found on farms throughout the upper Midwest and in some areas of the South.

The new breeds have often been featured as "tailor-made" hogs. They were bred to meet the demands of both consumer and farmer.

For the housewife, University scientists developed the hog to have more lean meat and less fat. At the same time, they sought to please the farmer with cheap, rapid gains. Today the new breeds reach market weight quickly with much less feed per 100 pounds of gain than the average.

The man who led in the development of the new breeds, Dr. L. M. Winters, professor of animal husbandry at the University of Minnesota, stresses the point that the hogs' special value is for commercial production. In other words, their best use is in cross-breeding with other established lines and breeds for market sales.

The Minnesota No. 1 and No. 2 have done well in crosses, especially between themselves. They transmit something to the crosses that speeds up growth and cuts down feed costs. That, of course, is what hog raisers are looking for.

The breeding project which led to the new hogs was started back in 1937. About eight years later the Minnesota No. 1 had been established as a line and was being used on Minnesota farms. A few years later the Minn. No. 2 was officially accepted as a new breed and stock went on sale in the State. The new breeds are not hybrids or crossbreds. By selection and inbreeding they have been purified to as great an extent as other common breeds.

The new lines have their own registry association just like other breeds. The Inbred Livestock Registry Association, located at University Farm, St. Paul, Minnesota, has charge of all registration of these two new breeds as well as for the Montana No. 1 hog and new lines of sheep.

The Minnesota No. 1 is a result of a cross of the Landrace and Tamworth. The new breed is basically red, but may have some black specks or spots. It is longer bodied and shorter of leg, and has

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Richmond, Virginia, September 1950

larger ears and a longer snout than most American hogs. When the carcasses are cut the packers have been especially well pleased with the length of belly (bacon) and loin and the smaller amount of fat.

The No. 2 is a result of a cross of a Canadian-bred Yorkshire boar with females of two inbred Poland-China lines. It has slightly longer legs and a shorter body than the No. 1. The No. 2's are spotted black and white with erect ears and have a slight dish to the face. Their main value has been to develop superior market swine through cross-breeding with other lines.

The No. 1 and No. 2 are not the only inbred lines that University of Minnesota is working on today. Several lines of Poland-China hogs are being inbred and used for crosses with the new breeds.

Today there are over 600 herds of No. 1 and 80 of No. 2 registered. These, of course, are breeding herds, and thousands of other farmers are using the new breeds in their cross breeding or commercial production. Dr. Winters estimates that there are well over 12,000 registered No. 1's in the United States with animals as far south as Florida.

Disease Control In Sweden

Condensed from American Agriculturist

Virgil White

ONE OF the most impressive observations made during my tour of Scandinavia was the low incidence of disease among the country's livestock. The Head of the Ministry of Veterinary Affairs in Sweden, Director G. A. Bouveng, told me that one of the most important factors contributing to the health of livestock in Sweden is the observance of the "Epizootic Law," enacted in 1935, which governs the control of epidemic animal diseases.

The law currently covers foot and mouth disease, rinderpest, bovine pneumonia, hog cholera, glanders, rabies, sheep-pox, anthrax, mange, fowl pest, fowl cholera, Newcastle disease, brucellosis, infectious hoof anemia, and distemper. Although covered by the law, glanders, rabies, rinderpest, bovine pneumonia, and mange are rare or absent in Sweden.

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Foot and mouth disease, the importation of which is an ever-present threat in our southwestern states, has not been found in Sweden since March, 1949. Hog cholera has been absent from the country for the last five years, fowl pest for the last two, and only one case of Newcastle disease was reported in the first three months of this year.

Control of bovine tuberculosis and of brucellosis are left pretty much in the hands of each individual farmer in districts in which epidemics have not been brought under control, but when one of the diseases involved has been brought under 95–99% control, the Epizootic Law is applied to the district, and all animals carrying the disease are systematically slaughtered. In each case the owner of the animal receives partial compensation from a public fund set up for the purpose; in the case of brucellosis, he receives full value of the animal.

The Ministry of Veterinary Affairs maintains very accurate statistical reports of the incidence of all animal diseases, and this information is published monthly for the benefit of veterinarians, who number almost 700 throughout Sweden.

Until 1947, the Veterinary Administration was one of seven departments under the direction of the Ministry of Health, which is a subdivision of the Department of Social Affairs. The particular problems of the veterinary department were, however, chiefly channelled through the Department of Agriculture.

The veterinary department is roughly divided into four sections. The so-called general section distributes a great deal of educational material, supervises quarantine stations and military veterinarians, and controls the standards required of livestock and fodder from abroad. The second department, concerned with hygiene, supervises the city and rural veterinarians, public meat inspection stations, the import and export of meat and fat, and hygiene concerned with milk and fodder in general.

The third department is concerned with control of specific diseases. This department supervises the control of several diseases of livestock, such as tuberculosis, with the cooperation of the farmers, themselves. It also controls those veterinarians and laboratories which are enlisted in such campaigns, as well as overseeing the general hygiene of the farm.

The fourth department deals with administrative matters and judicial questions in general. It is concerned with the general organization and personnel of the entire veterinary administration and with its relation to other sections of the government.

The problem of foot and mouth

disease in Sweden is mainly one of danger of infection from outside the country. The occurrence of this disease is intimately related to its occurrence on the island of Zeeland in Denmark, a very concentrated agricultural area with a large cattle population, which is separated from southern Sweden by only a few miles of water. Usually, the incidence of the disease in Sweden is from one-third to one-fourth of the incidence in Zeeland. The most serious outbreak in recent years occurred in 1948 when approximately 18,000 herds on this Danish island were infected, with about 5,000 herds infected in southern Sweden. The only other outbreak comparable to this occurred in 1936 when about 17,000 herds on Zeeland and about 5,000 herds in southern Sweden were infected. The disease seems to move in 5 to 6 year cycles.

I had the good fortune to be in Stockholm in July, 1949 at the time of the 12th International Dairy Congress, and attended a number of the sessions. There were several other 4-H boys present, and we learned a great deal from the Congress.

So far, the Swedish dairy industry has been collaborating chiefly in the eradication of tuberculosis and brucellosis. As far as bovine tuberculosis is concerned, the dairy industry has done its best to persuade the livestock owners to take remedial action, and economically compels them to do so by establishing different prices for milk sold to dairies. They also encourage the farmers to place their infected herds under state control for tuberculin treatment. Leaders of the dairy industry feel that dairies should now begin to encourage definite measures against streptococcic mastitis.

Brucellosis is handled chiefly through dairy cooperatives working closely with special bodies, set up to deal with the disease, in the veterinary organization or the county farming society.

As in many other countries in Europe, Sweden relies primarily on quarantine to protect the cattle population from epidemic diseases. In both Denmark and Sweden, when the disease has actually invaded the country to any serious extent, it is summarily dealt with, even if this involves slaughter of the animal. It is therefore difficult to compare the problem as encountered in these small countries with the problem faced in the United States, with its huge area and thousands of miles of frontiers of Canada and Mexico. The trend here is to rely more heavily on immunization of herds as the means of prevention. To combat infection, American veterinarians are enlisting the potent and miraculously effective drugs which have recently been developed.

It was a stimulating experience

for me to have the opportunity to consider the methods used in these agriculturally advanced countries. We can learn much from them and the converse is equally true.

EDITOR'S NOTE: The author, a 4-H Club winner of one of the National Poultry Awards, completed a tour of Scandinavia last summer under the auspices of the Lederle Laboratories Division, American Cyanamid Company. This trip was sponsored in the belief that American youth should come to know better our European farm cousins and their methods.

Cutting Costs of Corn Silage

Condensed from The Michigan Farmer

B. R. Bookhout and Karl Vary
Michigan State College

FARMERS are showing increasing interest in field chopping equipment. They hope to reduce the heavy work of harvesting hay, straw, grass silage and corn for silage. It is commonly accepted that field chopping equipment makes the harvesting work easier, but questions have been raised about the cost of using this equipment in comparison to the older types of equipment. To answer these with reference to corn silage, cost records were kept on 56 central Michigan farms. These farms were selected to include various types of silage harvesting equipment. The number of farms in each group does not indicate the relative importance of the type of equipment. More records of field chopping equipment were obtained because of the greater variation in method of use and size of equipment.

The cost of harvesting a ton of corn silage was lower on farms where field chopping equipment was used. The farmers with field choppers had lower labor and machinery costs than did farmers with binders and silo fillers.

The average cost of harvesting a ton of corn silage with a corn binder and silo filler was $3.47. The charge for using the binder and silo filler was 44 per cent of the total cost. This cost was high because the equipment was used only a short time during the year. One-half the farmers used their corn binders less than 20 hours per year and their silo fillers less than 40 hours. Depreciation and interest as well as operating expense made a high cost for each hour of use.

The usual crew for harvesting corn silage with a binder without a bundle loader and silo filler was

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5 or 6 men. This was about double the number of men where field choppers were used. About one half of the farmers used 2 wagons for hauling and the others used 3 The work with this equipment required from 3 to 5 tractors for power. The usual number was 4 tractors, 2 of which were owned by the farmer and 2 were used on an exchange basis with neighbors. With the usual combination of men and equipment, the farmers averaged between 4 and 4½ tons of silage put in the silo in an hour.

Five of the farmers had binders that were equipped with bundle loaders. The average cost per ton was a little lower on these farms but the chief reason for the lower cost was the greater tonnage of silage handled. The use of the bundle loader speeded up the work of harvesting silage to an average of 5½ tons per hour.

On farms where the bundle loaders were used, the usual crew was 6 or 7 men. An extra man for a wagon and a tractor were usually necessary on these farms. Using the loader did not reduce labor cost per ton since more men were needed to keep the machine operating continuously. However, work was easier because they did not have to lift bundles from the ground. Other advantages for the loader were that corn bundles did not lay on the ground and thus there was no chance of their becoming dried out or dirty.

The average cost of harvesting a ton of corn silage with field chopping equipment was $1.74. This cost was only about one-half the cost of harvesting with binder and bundle-loaders. The greatest difference was in the cost of using the equipment and in the charge for labor. The cost of using field chopping equipment averaged 59 cents per ton of corn silage on farms in this study as compared to $1.54 for binder and silo filler.

The farms using field choppers put up 46 more tons of silage per farm. This difference in tonnage does not account for all the difference in cost of using the 2 types of equipment. The use of field chopping equipment for harvesting hay, straw and grass silage was a major factor in reducing the cost of equipment since it spread the investment over more hours of use.

Analysis of the cost records indicates that farmers should have about 75 hours of work or more before they can afford the small field chopping equipment. With large field chopping equipment 125 hours of use are required to reduce the costs per hour to the same level as 75 hours for the small chopper. However, since custom rates for large equipment are usually higher, a farmer with about 80 or 90 hours of use could afford to own large equipment rather than hire it on a custom basis.

Keeping this information in mind, one might raise the question of how many hours a field chopper is used on any one farm. The best way to answer this is to take an example of the normal use likely to occur on a farm of a given size.

A Michigan dairy farmer with 15 to 20 cows and the usual amount of young stock would need to harvest around 75 tons of hay and about the same amount of silage. He would also harvest 25 to 30 tons of straw. If he used field chopping equipment, it would take him about 90 hours with one of the smaller choppers. With the larger chopper it would take him only about 60 hours.

Therefore, on a farm of this size the farmer could reasonably afford to own one of the smaller choppers, but he would need nearly twice as much work before he could justify buying one of the larger choppers. It should be pointed out, however, that some farmers would prefer to buy the larger chopper because they can get the work done in a shorter time. This sometimes means they can harvest the entire crop at the desired stage of maturity. Other farmers plan to do some custom work and therefore favor the larger type of equipment.

The charge for labor with field chopping equipment was only about one-half as great as with binders and bundle loaders. The use of field chopping equipment allows the farmer to handle corn silage with minimum physical labor. The chopper cuts the standing corn, chops it and blows it into the wagon. This means that one man can do the work in the field rather than a crew of 3 or 4. Most of the farmers, in this study, had mechanical unloading devices in their wagons. With the mechanical unloader one man can unload the silage. In some cases, the man hauling the wagons helped unload at the silo.

The usual crew with field chopping equipment was 3 or 4 men. Some farms used only 2 and a few used 5 men. The most common combination of men and equipment was the chopper and blower, 3 tractors, 2 wagons and 3 or 4 men depending on whether a man was kept in the silo. Two of the tractors were reported as owned by the farmer and the third tractor was rented from a neighbor or used on an exchange basis.

Farmers who had power take-off types of choppers reported that they preferred a 3-plow size tractor to operate the chopper. A 2-plow tractor in good condition gave adequate power on the blower except where very rapid unloading was desired. A few reported difficulty in hauling the chopper and a towed wagon through soft areas in corn fields. An extra man and tractor were

needed to haul the wagon beside the chopper.

Many types of unloading devices were used with field chopped silage. The type did not make much difference in the speed of unloading. The capacity of the blower and the power of the tractor determined the rate of unloading. A man was required at the blower to keep silage feeding in evenly and to prevent plugging.

The canvas and the false end-gate unloader were the types most commonly used. Farmers with false end-gate unloaders reported that its chief advantage was the low original cost and low maintenance. Farmers with canvas unloaders reported that the load moved easier and could be moved in sections by spreading the canvas with 1 to 3 overlapping folds in the bottom of the wagon. Some farmers have built special wagons with manure spreader type conveyors. Most of these wagons do a good job of unloading, but their cost is usually rather high and the wagon and rack are heavy even when empty. A few farmers pitched silage out a door in the side or rear of the wagon. They reported 2 men could unload the silage as fast as the blower could handle it.

There was a wide variation in the amount of work accomplished with field chopping equipment. The average amount of silage harvested was 7 tons per hour. Records show the number of tons harvested per hour ranged from 3 to 12. Part of this variation was due to the size and type of equipment, field conditions and the distance hauled. However, a major cause of variation was the way the work was organized.

For example, on one farm it took 55 minutes to haul the wagon to the field, load it, return to the barn and unload. On another farm it took only 22 minutes to do the same work. Most of this difference was due to waiting for someone else to do another job, and to poor arrangement for changing wagons from the chopper to the hauling tractor and positioning the load at the blower.

On the farms where the work was well organized the chopper was usually considered to be the key piece of equipment. Work was planned to keep the chopper operating as nearly continuously as possible. When adequate power was available at the blower, the silage could be unloaded in less time than it took to chop a load.

The average time required was 9 minutes to chop and 4 minutes to unload a ton of corn silage. This means that, where the arrangements for positioning the load at the blower work smoothly, the load could be brought from the field, unloaded, and the empty wagon returned to the field without keeping the chopper waiting. Ordinarily a third wagon

is not necessary unless the field is so far from the silo that much traveling time is required. In many cases a third wagon slows down the work because of the increased time spent hooking and unhooking wagons from the hauling tractor.

Many farmers hired field chopping equipment on a custom basis. The custom operator usually furnishes the chopper and blower, 2 wagons, one or 2 tractors and one or 2 men. The usual rates were from $8 to $10 per hour where only one man and one tractor were furnished, and $10 to $12 per hour where 2 men and 2 tractors were included.

The average cost per ton of silage was $2.15 where the work was custom hired. This was a little higher than on farms where the equipment was owned. However, farmers who were hiring the work on a custom basis put up only about one-half as much silage as farmers who owned the equipment. This illustrates that on small farms the advantage of using field chopping equipment can often be obtained through custom hiring rather than owning the equipment. On larger farms there would be an advantage to owning the equipment.

Planting Plans and Techniques

Reprinted from American Fruit Grower

A. F. Vierheller
University of Maryland

MILLIONS of fruit trees have been planted in possibly hundreds of ways with but three final results: Either the trees thrived and produced well, or they struggled along indifferently, or they dried up and died. Stock soil, location, and the human element each make a contribution to the success of failure of trees to survive, and some of these factors might well be discussed as a guide to future plantings.

First, there should be something worth planting and that calls for *good planting stock.* This stock should be vigorous, of good size for its age both in caliber and height, with a good root system. Generally, one-year-old apple, peach, plum, and cherry trees of desirable height are recommended,

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although age of nursery stock is a disputed question.

A loam-type soil, either clay or fine sand, well supplied with organic material, a soil that will hold moisture, yet will drain well, is preferable. Exposure may not be of too great importance; however, excessively rough or steep land or locations in a frost pocket or where air and soil drainage is not good should be avoided.

It is almost impossible to find the ideal setup for an orchard, but careful attention to these essentials will avoid wasted energy, uncertain expectations, and loss of money.

Before planting, some long-distance planning is in order, as the fruit crop will occupy the field for several years. Selection of varieties is a real problem. This involves consideration of present market favorites, varieties best adapted to the section where the orchard is to be located, succession of ripening, avoiding varieties already produced in excess, selection of varieties that do not have production difficulties, attention to pollination requirements, location of the variety blocks, and the proportion of the various varieties to be planted.

Fruit varieties go out of style just as clothing styles, but not as rapidly. The scores of apple varieties offered on the market a quarter century ago or more have dwindled down to about 15 standard ones that the consumers demand. Now the trend is toward the red sports. Color, not flavor, seems to be the selling point.

Peach varieties are moving rapidly across the stage as the competing producing sections attempt to move into a different harvest season with a larger, sweeter freestone that will find the weak spot in the competing market season.

Some very good market varieties are a headache to the grower. Certain varieties of peaches rot easily or soften before they are ready to harvest. Some apple varieties are shy bearers or poor pollinizers or have undesirable tree characteristics. Other very desirable varieties may be in over-production for the immediate section where they are produced. Similar problems prevail with pears, plums, and cherries.

An important factor to the success of any fruit is that of *pollination*. With the exception of a few varieties, peaches are self-fruitful. All fruit varieties, however, should be interplanted to insure maximum pollination. The general rule is to plant the pollinizing variety not more than 80 feet from the variety to be pollinated. The usual plan is to alternate four rows of the self-unfruitful variety with two rows of the pollinizer. The number of pollinizer rows may be varied, but it is not advisable to plant more than four rows of the self-

unfruitful variety as a solid block as this reduces chances of pollination.

The old argument regarding the use of *filler trees* is still with us. Filler trees result in problems of soil management, spraying, fertilization, pruning, and, finally, tree removal. The whole matter of the use of filler trees can be settled by asking these questions: Is there a profit to be derived from filler trees? Is it worth the effort, considering costs, and the effects upon the soil and the permanent trees? Has there ever been a grower who removed filler trees at the proper time?

The earlier ideas of *planting distances* have been revised with the development of orchard machinery and a better understanding on the part of the grower of plant nutrition. The fruit farm operator is finding that greater distance between trees makes for easier and better orchard operations. And because of the increased moisture, fertility, and sunshine thus made available, the trees grow better and the per acre production of fruit of high marketable quality is greater.

Apple trees are usually planted 35 to 40 feet apart. If filler trees are used, the permanent trees may be set 36 to 40 feet and the filler trees set in the rows 18 to 20 feet from the permanent trees. The fillers should run only one way across the orchard; if planted in both directions, a wilderness results.

Peaches are set from 20 feet upward. There are peach orchards running 24 by 24 feet to 30 by 30 feet, with all variations.

Plums are set 20 by 20 feet, pears 20 by 25 feet, sweet cherries 30 by 30 feet, sour cherries 25 by 25 to 30 by 30 feet. These distances may increase or vary according to local or regional conditions.

The advent of soil conservation campaigns has caused the fruit grower to become erosion-conscious. Past follies of orchard soil management have shown us the error of heavy cultivation, of neglecting cover crops or mulching, and the consequent formation of gullies and other forms of soil erosion.

Under the various conditions existing in the different orchards, our methods of erosion control will differ. It has been demonstrated that if the slope of the land is not too abrupt, the growing of suitable cover crops, properly seeded, heavily fertilized, and correctly managed, will take care of the erosion problem.

The contour system used on the more sloping orchards is working out rather well, but there remains the problem of dead-end or point rows, also the question of distance between trees and the problem of planting pollinizers. In places where the rows are too close together, it would be better to omit

a tree or two and place the trees closer in the row. These narrow spots and point rows make spraying difficult; but this is part of the price of erosion control.

There are growers who contend that trees staggered on slopes impede air drainage. If the orchard is to be located on land sufficiently steep to require terraces, it is well to work out the plans well ahead of planting time. First of all, there should not be too many terraces which would cause the impounding of so much water that trees would drown. In throwing up the terraces, the channels should not be cut to the subsoil, then seeded, with the expectation of growing a cover crop. Also, the terrace should be allowed to settle before the trees are planted.

Terraces should be made in the fall if the trees are to be set the following spring. And, just as important, the trees should be planted either on the berm or below the berm of the terrace, not on the upper slope, as the trees may drown. Fruit trees, especially peach trees, do not like wet feet, so make sure there is sufficient slope to move the water along the channel above the terrace where it will not form puddles that will seep around the tree roots.

Before undertaking a heavy job of "face-lifting," it would be better to consider whether the site is a good one for fruit growing.

Now, let's get down to that *planting* job. The soil should be put into shape by working it down. If fall or winter planting is done, the cover crop may be seeded without interfering with later planting. If spring planting is done, the cover crop in the rows may be disked down, before planting, but if the planting is done early, as it should be, the cover crop will not interfere.

The question of fall (early winter) or spring planting is a local one. Where winter temperatures do not drop below zero, fall planting is considered safe. Fall planting allows the trees to become established and is done during a slack labor season. There is considerable opinion that good trees planted carefully and early in the spring are about as good as fall-planted trees.

Laying out the orchard site on the square system may be done either by surveyor's transit or by the sight and stake method. In the latter system, a base line is established and a second side is run at right angle to the base line.

After marking off row distances on these sides, the tree locations are sighted at the intersecting lines and marked. The rows may be plowed out and the trees set where furrows cross, in which case set only a sufficient number of tall stakes to allow the tractor operator to sight ahead as he moves along; it is not easy to run a straight line with a tractor.

In small plantings where hand digging is to be done and the trees sighted, the sighting stakes should be located between the rows, so they will not be disturbed and may be used to check back in case of error. An economical method for laying out a small orchard is to use a corn planter wire and set small stakes in the tree locations.

In contour plantings, the rows are laid out by spirit level.

Tree holes may be dug with a mechanical posthole digger or by hand. But no matter how the holes are dug, they should be sufficiently deep and wide to accommodate the root system. Where a post-hole digger is used, the trees should be permitted to settle, unless the holes are large enough to allow good foot work as the soil is firmed around the roots.

In hand-digging, the top soil should be kept in a separate pile for use around the tree roots. Where mechanical digging is done, the top soil for filling in the bottom of the hole may be scooped off the ground around the hole.

The trees should be heeled in as soon as they arrive from the nursery. To keep the roots moist during the planting operation, cover them with wet burlap bags.

If the planting crew is small, one man can carry a small bundle of trees along the rows as they are being planted; with a large crew, the trees may be dropped from the truck ahead of the planters.

The roots of the trees should be trimmed only to remove broken parts or to shorten unusually long ones. Set the trees slightly or no deeper than they were in the nursery. Deep planting has killed thousands of trees, especially peach and cherry. Tramp soil firmly about the roots as the hole is filled.

It is not necessary to mix fertilizer in the hole, but if fertilizer is so used, it should be mixed thoroughly with the soil and used sparingly. Nor is water necessary unless the planting job is done in late spring and the soil is dry or the trees are showing signs of growth.

If trees are set in the fall or winter, they should not be pruned until spring, as there is danger of freezing injury. Spring-planted trees may be pruned immediately after planting. Fertilizer may be applied as a topdressing after the trees have begun growth. Either nitrogen fertilizer or mixed fertilizer high in nitrogen is recommended.

The usual dosage of nitrogen fertilizer is about one-quarter to one-third of a pound of nitrate of soda or its equivalent of nitrogen per year of the tree's age, or two-thirds of a pound per inch diameter of the trunk. Mixed fertilizer applications should be proportionally heavier according to analysis.

One of the best treatments for the young tree is a "manure poul-

tice" or mulch consisting of a few forkfuls of strawy manure placed around the tree base.

By controlling mice and adding a little fertilizer each year, the young tree will thrive beyond expectation. Where young replant trees have been set in rows between the old trees which will be removed later, this system of mulching has been highly successful.

How best to plant a tree? Get the best stock you can find and try to give it the best care you can afford to encourage early production and a vigorous framework. Get located on a good foundation and avoid drastic or risky short cuts. When in doubt consult experienced growers or state or federal authorities.

Determining Relative Return

Condensed from Ohio Farm and Home Research

C. F. Monroe

MANY discussions have arisen over the relative profitableness of selling high testing milk as compared with selling a lower testing milk. It is evident that the market price paid for the extra fat in the higher testing milk and the relative producing ability of the cows or herds should be considered in such discussions.

Although premiums are paid for extra fat in the form of point values or differentials, there is always the question whether these values are favorable or unfavorable in properly compensating for the lower volumes of the higher testing milk. Likewise, questions may be raised about the fairness in making comparisons between cows or herds in regard to their producing ability because of the differences in butterfat tests. If these comparisons were being made between cows where the butterfat tests were the same or nearly so, it would be evident that we couldn't expect the lower producing animals to be as profitable as the higher producers. The same reasoning should be applied to comparisons where high and low testing cows are involved.

Frequently, comparisons are made by simply considering the total yield of butterfat. The objection to this is that it does not give the cow credit for producing anything but butterfat. When milk is sold, the solids other than butterfat contribute to the value of the product. The other solids—such

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as the proteins, sugars, minerals, and water soluble vitamins—in addition to contributing to the value of the product, require energy for the cow to produce them. In fairness to the cow, therefore, we should give her credit for the solids-not-fat that she puts out as well as the butterfat, especially since these solids-not-fat have a high nutritional value.

This may be done by comparing the yields on an energy output basis, which is another means of expressing the work performed by the cows in secreting milk. A formula for doing this was developed several years ago by Dr. W. L. Gaines, of the Illinois Experiment Station. By this method the milk may be computed to a standard 4 percent fat corrected basis. Credit is given for both the solids-not-fat and the fat in the milk. The formula is as follows: 4 percent Fat Corrected Milk (F. C. M.) = .4 × pounds of milk, plus 15 × pounds of butterfat. This method has been generally accepted by research workers and is used to compare productions where differences exist in the butterfat tests.

Let us suppose Cow A gives 10,000 pounds of milk containing 350 pounds of butterfat in a lactation, and Cow B gives 8,040 pounds of milk containing 402 pounds of butterfat. Cow A has an average test of 3.5 percent and Cow B, 5 percent. How do these two yields compare? It will be noted that Cow A failed to make the 400 pound fat class, whereas Cow B did.

These two cows are approximately equal in their yields as rated on this basis, which is another way of saying they did about the same amount of work or are of equal producing ability. It would seem logical, therefore, that there is a sound basis for comparing the market values of these two productions. These illustrations were used for the purpose of showing equalized productions. They are not intended to show the relative productions, in general, of cows producing low and high testing milk.

Since it is difficult to imagine the same price for milk throughout the year, let us assume that in the previous example the productions represent the amounts of milk sold in 30 days by two producers, A and B. Let us apply to these the prices for milk in December at Markets 1 and 2. These were for Market 1: $3.81 per cwt. with an eight cent differential, and for Market 2, $4.02 with a 6.5 cent differential. The hauling charge of 25 cents per cwt. would be the same in each case.

Illustrations of Computing 4% (F. C. M.) Milk

Cow A
10,000 pounds milk × .4 = 4,000
350 pounds butterfat × 15 = 5,250
4% (F. C. M.) Milk = 9,250

Cow B
8,040 pounds milk × .4 = 3,216
402 pounds butterfat × 15 = 6,030
4% (F. C. M.) Milk = 9,246

It is not difficult to see that the high point value on Market 1 made a noticeable difference in the price received for the milk. The higher testing milk has an advantage in reducing the total hauling charge. The differential on Market 2 was lower than that on Market 1, although the base price of the milk was higher. This brings up the question as to the equality of the fat differential or point values.

If we take the F. C. M. formula and apply it to 100 pounds of 3.5 percent milk it will be found that this represents 92.5 pounds of 4 percent F. C. M. milk.

100 pounds	milk	× .4 = 40
3.5 pounds	butterfat	× 15 = 52.5
	4% (F. C. M.) Milk =	92.5

Therefore, when 100 pounds of 3.5 percent milk sells for $3.81 per cwt. it is equivalent to 100 pounds of the 4 percent milk selling for $4.12 ($3.81 ÷ 92.5 × 100). The difference between these two prices amounts to 31 cents. Since this represents five points, one point would have a value of 6.2 cents.

Applying this same method to the prices for Market 2, we find that the difference would be 6.5 cents. Thus, the differential on Market 1 of 8 cents per point is high by 1.8 cents per point, and the Market 2 price of 6.5 cents is just right (to the nearest .1 of a cent).

In presenting this method of calculating the relative returns from high and low testing milk, attention should be called to some other factors that should be considered. Included in these factors are the relative feed costs and any premiums that would be paid for the milks. It is realized that the method of computing the milks to the same energy basis is not employed in establishing the price of milk or the point values. These prices are determined by trade practices.

The method presented here for determining the relative return from high and low testing milk is one that may be of use and interest to the producer. A means is presented for determining whether the point values are favorable or unfavorable for milk testing in excess of the base. By this method also, milk productions from different herds and cows of unlike butterfat tests may be computed to the same basis so that fair comparisons may be made in the relative returns from the sale of the product.

Using Market 1 Prices

10,000 lbs. 3.5% @ $3.81 sold for $381.00 less $25.00 hauling = $356.00
8,040 lbs. 5.0% @ $5.01 sold for $402.80 less $20.10 hauling = $382.70

Using Market 2 Prices

10,000 lbs. 3.5% @ $4.02 sold for $402.00 less $25.00 hauling = $377.00
8,040 lbs. 5.0% @ $4.995 sold for $401.59 less $20.10 hauling = $381.49

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Most men do not care how nobly they live, but only how long, although it is within the reach of every man to live nobly, but within no man's power to live long.

—A statement by the philosopher, Seneca, in the year 52 A.D.

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